

POPULAR Computing WEEKLY

35p 30 June-6 July 1983 Vol 2 No 26

This Week

Dragon disc drive

Keith and Steven Brain take a close look at the Kelta Disc drive for the Dragon 32. See page 14.

Inside Pimania

David Kelly gets to grips with *Pimania* purveyors Automata and is told of their latest project *Groucho* on page 13.

Spectrum check

Ian Logan continues with part two of his five part series on the Spectrum and this week looks at syntax checking. See page 20.

New releases

Coverage of the new games from Virgin including *Yomp* and news of a *Forth* package for the Oric. See page 45.

STAR

Space Docking on Spectrum. See page 10.

GAME

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JUPITER ACE and ZX81 software. For the Jupiter Ace: JA1 Three 3K games, £3; JA2 19K graphic adventure, £6; JA3 19K text adventure, £7. For the 16K ZX81: Z11 A graphic adventure, £5; Z12 Hangman, £4. Richard Roberts, 52 Whalesmead Road, Bishopstoke, Eastleigh, Hants SO5 6HL.

News Desk

Wind-down for the Model A

ACORN computers has decided to discontinue the BBC Model A machine.

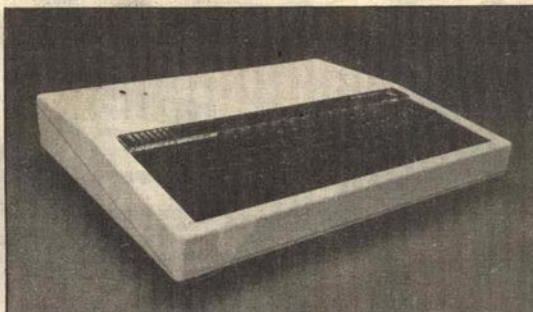
Production is currently being wound down and a spokesman commented: "The reason is that nearly all of the orders now are for the BBC Model B and those who do buy As are tending to upgrade to Bs very quickly."

Acorn denies that the decision has been taken because the now-imminent Electron machine will supersede the Model A. "Although it looks

like that, it is purely coincidental," he said. "It happens that people who buy the BBC seem to want the greater power of the B. If demand had been the other way around it would be the Model B that we would be stopping instead."

"The Electron, on the other hand, will tend to be attractive to people still on Sinclair-type machines," he added.

The price of the Electron has now been fixed at £199. The BBC Model B remains at £399.



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Continued on page 40

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Accuracy

Popular Computing Weekly cannot accept any
responsibility for any errors in programs we
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make sure programs work.

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Editorial

The electric car has long been dreamed of by motor companies and environmentalists alike. Such a car would be non-polluting, economic and, above all, cheap.

Companies such as Ford, General Motors and the Japanese conglomerates have commissioned design studies, built prototypes and tested a dozen different models. However, none of them have produced a vehicle that is commercially viable.

Now, Sinclair, with his acquisition of an option to purchase the defunct De Lorean car plant, has publicly thrown his hat into the ring. This is not, however, a sudden move on Sinclair's part. He has been working on the project since at least 1973 and had probably been formulating ideas long before that.

An electric car would certainly be a considerable coup for Sinclair, since he would be succeeding where many have already failed. But, there are a number of technical problems still to be overcome before the Sinclair-mobile takes to the road.

Most conventional lead/acid or nickel/cadmium batteries are too heavy in relation to their output to make a suitable power source. They also need to be recharged frequently.

If Sinclair has come up with a new type of battery, or a method of making existing batteries more efficient, the world's first mass-produced electric car may yet have a ZX logo.

Next Thursday

Next week's Star Game is Mini Pacman by Richard Walton — it's for the super expanded Vic20 but can be easily adjusted for the unexpanded Vic.

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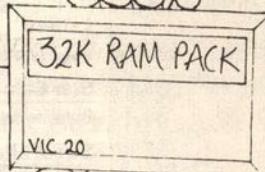
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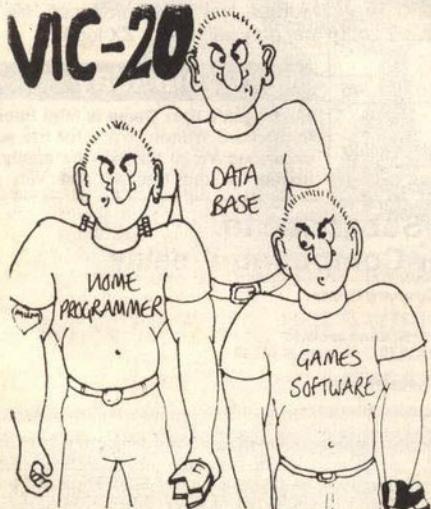


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Double trouble for Spectrum games

SPECTRUM Games has been forced to withdraw its *Penetrator* program for the Vic20.

The decision follows discussions with Melbourne House who market a program with the same title for the ZX Spectrum.

Melbourne House threatened legal proceedings against Spectrum Games if the Vic20 program continued to be sold. Melbourne's Christine Laugherne said: "There is a law about passing-off. If they



Managing director, David Ward



don't stop selling the game we will bring an injunction to stop them."

Commenting on the decision to withdraw the Vic-20 *Penetrator* program, Spectrum Games' managing director David Ward said: "We decided that it was better to do so to avoid any confusion between the two games."

Manchester-based Spectrüm Games has produced a range of arcade titles for the Spectrum and Vic machines.

change hands through the brokers on a matched-market basis.

Statham Duff Stoop are on 01-628 5070.

Texas second victim of vicious US war

TEXAS Instruments has followed Atari to become the second victim of the vicious US price-cutting war.

Following the forecast of a \$100m loss for the second quarter of this year — leaked to the *Dallas Financial Times* on Friday June 10 — TI's share price plunged 51 points in two days. This wiped out nearly \$1bn in equity and was one of the sharpest market declines in recent American history.

Texas' loss comes mainly from the home computer division, where the April price drop of the TI99/4A by \$50 to only \$100 spectacularly failed to produce an upturn in sales.

The company showed only one 'new' product at the recent Chicago trade show — a re-vamped 99/4A in a different case, designed to reduce losses on the product.

Of the big three US manufacturers only Commodore remains comparatively unaffected — following Atari's dismal recent financial results, Commodore's share price suffered following Texas' bombing

shell, but the company has just announced results for the quarter ending March 31 up to 124 percent to \$25m.

Commodore is now selling the 64 machine for only \$199 in the US and offering a staggering further \$100 rebate off the price in exchange for a used Vic20.

Commodore International's chief, Jack Tramiel, in town for the Earls Court show, denied that the price war in the US had now gone too far: "Not at all. It is all to do with the learning curve — as we improve our yield and manufacturing efficiency, we can reduce prices. We do not wait until we are forced to cut prices — we do it when we can."

● THE price of the Commodore 64 machine will fall to £229 from August 1.

But, retailers are expected to discount this price still further to bring it down under the £200 barrier.

Lynx shares offer

IF you ever hankered after becoming a high-technology investor, now is your chance.

A new company, Computers Holdings plc has been set up by Computers, manufacturers of the Lynx Microcomputer. Some 25 per cent of the company's share capital is being offered for sale.

Up to 6,400,000 ordinary 10p shares are available at 17p a share and the sale will raise about £900,000 to fund further expansion and development work necessary in the coming year. The shares offer is open to any individual. Although Computers is keen to encourage small investors, a minimum purchase of 3,000 shares (£510) is suggested.

For those who wish to know about such things, stockbrokers Statham Duff Stoop are handling the share placement. The directors of Computers forecast a profit before tax of around £750,000 for the year ending March 31, 1983, and the shares have a prospective fully-taxed profit/earning value of 12.0. In due course, Computers Holding plc will seek a full stock market quotation. Until then shares will

Bug-Byte on the move!



LIVERPOOL-based software house Bug-Byte has moved to new offices in the city.~

The 6,000 sq ft office complex at Mulberry House, Canning Place, cost £50,000 to fit out to Bug-Byte's specifications. Work was completed in early June.

This move concentrates Bug-Byte's activities under one roof. Spool Ltd, which is half owned by Bug-Byte, is a new tape duplicating company that is also located in Mulberry House.

Using a Gauss half-inch loop-bin system, Spool duplicates tapes at 16 times normal speed. Director Roy Varley plans to build up capacity to 25,000 tapes a week by the beginning of August.

Bug-Byte, which was founded in the spring of 1980 by Tony Baden and Tony Milner, is also planning an export drive. Sales Manager John Phillips is hoping to establish new markets in the US, Europe, Australia and New Zealand.

Spriteful system for the Dragon

PREMIER Micro Systems has developed a graphics system for the Dragon computer.

The hardware/software combination takes the form of a cartridge which plugs into the Rom port on the Dragon. Using a combination of the TI99/26 video chip and 16K additional video Ram, the graphics card gives the Dragon a high-resolution 192 x 256 display in 16 colours and a 32 sprite (movable graphics shapes) capability.

Sprites up to 36 x 36 pixels (4 x 4 characters) in size can be defined using Basic commands which take the form of an extension to the existing Microsoft Basic.

Premier also plan a motherboard card rack and six-voice sound card for the machine.

The graphics system should be available in September for under £100. Details from Premier Micro Systems, 208 Croydon Road, Anerley, London.



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WARMASTERS ANNOUNCE 4 GREAT NEW TITLES

JOHNNY REB

This full-graphics wargame, for 1 or 2 players, is set during the American Civil War and is played entirely on a graphics battlefield which is generated slightly differently each game. Each side selects its force of infantry, cavalry and artillery with which it must capture the enemy's flag. You have full keyboard command of all movement and fire controls. A 'Save Game' facility allows a partly-played game to be reloaded to test different tactics! PLAY THE COMPUTER OR CHALLENGE A FRIEND. A SELL-OUT AT THE ZX MICRO FAIR. AVAILABLE FOR 48K SPECTRUM £5.50.

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PARAS

You have command of a small parachute force (hand-picked by yourself) which has been dropped behind enemy lines to capture an important river crossing. Keyboard command allows you to manoeuvre and fight on the modified hex-grid battlefield. You can play either a standard or a shortened version of the game with several levels of play. AVAILABLE FOR BBC MODEL B £6.95.

BATTLEZONE 2000

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OTHER TITLES

TYRANT OF ATHENS available for DRAGON: SPECTRUM 16K; ZX81 16K; TANDY 32K COLOR.

ROMAN EMPIRE available for DRAGON: SPECTRUM 16K; ZX81 16K; TANDY 32K COLOR; ATARI 400 & 800 48K; AND NOW BBC MODEL B.

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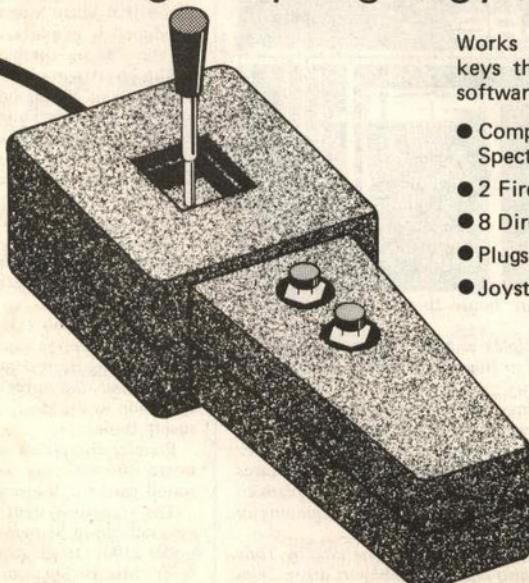
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LETTERS

Invidia dragoris . . . 1

My thanks to James Thomas for his exaggerated but amusing diagnosis (2-8 June).

For the record, I am not envious of the Dragon's switches and keyboard. The Spectrum's rubber keys may be 'squidgy' but, because of the computer's one-word entry system and comprehensive syntax checking, it is far easier to type and run a program on the Spectrum than it is on the Dragon with its almost illegible black on green screen.

Neither am I jealous of the other six items in Mr (or should I say Dr?) Thomas's list including the Dragon's superfluous sockets and modes — the highest resolution is no higher than that of the Spectrum. As for expansion capabilities, you may have noticed that the Spectrum, but not the Dragon, has pages on Prestel's Micronet database.

A friend of mine had a Dragon but sold it to buy an Oric which proves that, often in the world of micros, paying less buys you more.

Anyway, most Spectrum owners are content in the knowledge that their micros have lower-case letters, user defined graphics, the ability to mix hi-res graphics with text and to change the colour of text. All these facilities are non-existent on the Dragon. The Spectrum also has the added bonus of the best range of software for any colour micro in the UK. It is not a huge surprise that Uncle Clive has become Sir Sinclair.

Andrew Wiseman
68 Mayfield Road
Hartford, Huntingdon
Cambridgeshire PE18 7NJ

Not a minor matter

I refer to the article *Turning Turtle* in your issue for 9-15 June which includes the statement "It is not difficult to use these routines for a Logo-type emulator". The routines turn out to be for screen formatting, plus an ability to move a turtle forward and to turn it through an angle. Your readers without knowledge of Logo and Turtle Graphics

must be left in mystification. Is that it? Is that what the Massachusetts Institute of Technology spent their time on?!

Accepting that the article aims at technical detail rather than rationale, it is unfortunately only one example of "popular writings" on the subject over the last year which give a corrupted and trivialised view of Logo to the uninformed reader. The capability outlined in the article is no nearer to serious Turtle Graphics than a firework rocket is to landing men on the moon.

Logo is a language designed to encourage and facilitate learning in the context of a particular educational philosophy. Turtle Graphics is a successful and widely used, but only a specialised and partial, realisation of the language. Whilst true Turtle Graphics implementations can fit into microcomputers, they are significant software packages, and I would warn readers to be cautious about regarding any magazine listings for such programs as other than toys. As a minimum the following language constructs are required:

- Instructions to move, turn, position and reset the turtle in absolute and incremental modes.
- Instructions to name, define and call procedures containing combinations of such moves, in hierarchies.
- Instructions to provide nestable repeat loops in programs and procedures.
- Local (to procedure) and global variables, with arithmetic and variable display capability.
- Whilst providing these facilities, procedures must be recursive and allow conditional termination.
- A range of plotting, colour and administrative instructions needed.

To make such a language usable, any real implementation must include a significant operating system, with an editor, syntax checking, error messages, listing capability and the rest.

My regrets to this particular author that his offering has provoked this 'last straw' response. Editors equally should ensure that articles clearly state their context and scope. Gross misrepresentation of a

promisingly fruitful approach to human development is not a minor matter.

M Davies
Lymington Bottom
Four Marks
Alton
Hants GU34 5AH

Boris Allan writes: Readers of Ziggurat will know the difference between Logo and Turtle Graphics — my TG routines follow those of UCSD Pascal.

I imagined that a Logo-type emulator might be a Logo interpreter written in BBC Basic — I am not silly enough to claim that the routines are like Logo.

If Mr Davies looks through his list of requirements, he will see that they are all satisfied by BBC Basic. The examples given in my second article (*Popular Computing Weekly*, June 16-22) include all Mr Davies' requirements, even down to recursion.

Over-heated sword!

Sir Clive Sinclair? I trust he will have to wait over 16 weeks before being dubbed and then have the sword overheat.

Richard Carsons
3 Cornflower Close
Simons Park
Wokingham
Berks RG11 2UF

Invidia dragoris . . . 2

As a colleague of Mr Andrew Wiseman I wish to explain his computer-induced neurosis. The allegation that he envies the Dragon 32 computer is entirely true. Mr Wiseman can be described as a "Sinclair freak" as he takes everything Uncle Clive makes and hails it as the best in the world.

With the arrival of the ZX Spectrum he happily sold his ZX81 and sent off his Spectrum order form. When it finally arrived he was extremely happy, until I decided to purchase a Dragon.

With the obvious better features of the Dragon he grew envious and started to find any way possible to criticise the Dragon.

I hope that this letter will end this argument once and for all. Mr Wiseman should be satisfied with his inferior machine, although it is evident to anyone but a fool that the Dragon is a better computer.

I would like to add that I have recently purchased an Oric-1 micro, so any letters from Mr Wiseman slagging off that computer should be ignored as he is just getting neurotic yet again.

Michael Smith
57 Pettis Road
St Ives
Huntingdon
Cambs

Legal copying

As a supplier of a tape copier for the Spectrum (plus a ZX81 system), I would like to answer the comment on the legality of such programs (*PCW* 16-22 June).

Copying of tapes always has been legal. Indeed, the suppliers of all the various games cassettes advertised have their cassettes made by large companies specialising in the copying of cassettes. Obviously, a legal process, as is the making of 'back-up' copies of your own cassette for your own use only.

It is totally illegal to copy tapes, either by copier programs or by tape-to-tape method, if the copy is for 'giving away' and not for your own use. Suggesting the banning of such copier programs has the same validity as suggesting that all photo-copier machines should be made illegal.

Further to the above, I am appalled at some of the so-called copies available. (I have studied the 'opposition'). The majority will copy all programs, including Datafile (headerless type), but some use as much as 750 bytes of your program area. In a 16K Spectrum this is about 10 per cent of your usable area.

It is unnecessary for a copier to use any of your memory area. (Mine uses none, yet still allows the user to simply press a button to make a copy.)

G A Bobker
29 Chadderton Drive
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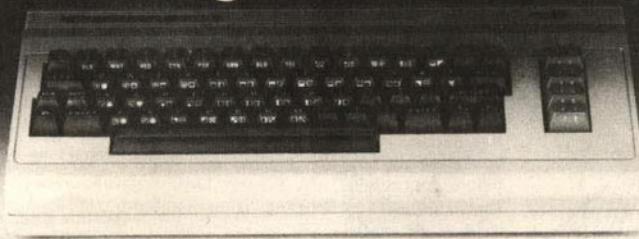
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Space Docking

A new game for 16K Spectrum by Colin Jones

Your on-board computer has locked on to a satellite that, after 10 years in parked orbit around the Earth, is to be retrieved for routine servicing.

You are aware of a knot of tension in the pit of your stomach as you take the controls of the huge space shuttle, preparatory to making the fine synchronisation adjustments necessary for successful docking. The grim concentration on your

face is a cold blue, lit by the flickering light emitted by your data screen. The screen shows an image constantly changing as the satellite moves through space.

The gleaming shuttle ponderously rotates towards the tiny fragile satellite as you use the side thrusters to match the spin. As the screen indicates that you have achieved synchronisation, you nudge your shuttle forward.

A huge image now fills the screen to indicate your proximity to the satellite. You are within seconds of final dock. Panic tries to seize you! You see that the satellite has suddenly started to drift away from you! Have you time to match the new spin before you collide?

Commentary

35-60 Set variables
70-90 Screen display

100-160	Read keyboard
170-260	Display indicators (distance/spin sync./time left)
270-290	Display new satellite image
300-340	Set spin factors
350-450	Remove old satellite image/calculate new image
370	NOTE — To test 'docking complete' sequence
460-490	Calculate new spin/approach factors
500-530	Docking completed
540-600	Score/new satellite?
610	Ran out of time
620	Crash

Variables

L — cumulative score
J — time remaining
P — horizontal line of sat. image
I — input from keyboard
K — spin display position
RA — rate incr/decr. distance from sat.
R — size of sat. image
RT — rate spin incr/decr.



```

10 REM SPACE DOCKING
20 REM BY CS JONES
30 REM *****
35 LET L=0
40 LET K=0: LET J=20: LET RA=1
LET P=0: LET R=5.5: LET I=1
50 LET RT=INT (10*RND)/10: LET
S=INT (100*RND)
60 IF S>50 THEN LET RT=-RT
65 PAPER 1: INK 7: BORDER 1, C
LS
70 CIRCLE 127,87,86, CIRCLE 12
7,87,84, CIRCLE 127,87,43
80 PRINT AT 8,15;"UV";AT 10,8;
"=";AT 11,8;"="
90 GO TO 400
100 IF INKEY$="" THEN GO TO 330
110 LET I$=INKEY$: LET I=CODE I
$-48
120 IF I=5 THEN GO TO 320
130 IF I=6 THEN GO TO 470
140 IF I=7 THEN GO TO 460
150 IF I=8 THEN GO TO 300
160 GO TO 100
170 INK 4: PRINT AT 1,0,"": AT
20,0,"": AT 1+R/10,0;"": AT 20-R
/10,0,"": INK 7
180 IF R>=88 AND C>=124 AND C<=
132 AND D>150 THEN GO TO 500
190 IF R>=88 THEN GO TO 620
200 INK 2: PRINT AT J,31: INVER
SE 1,"": LET J=J-.15: INVERSE 0
INK 7
210 IF J<=1 THEN GO TO 610
220 PLOT INVERSE 1,10,K: DRAW I
NVERSE 1,10,0
230 LET K=87+100*RT
240 IF K>=170 THEN LET K=165
250 IF K<=5 THEN LET K=10
260 PLOT OVER 1,10,K: DRAW OVER
1,10,0
270 PLOT OVER 1,X,Y: DRAW OVER
1,-A,-B
280 PLOT OVER 1,C,D: DRAW OVER
1,B,-5,-A,-5
290 GO TO 100
300 LET RT=RT+.02
310 GO TO 330
320 LET RT=RT-.02
330 LET H=INT (RND*100): IF H<=
40 THEN GO TO 460
340 IF H>60 THEN GO TO 490
350 LET P=P+RT
360 LET R=R+RA
370 REM *#TO TEST LET P=0 HERE*
380 PLOT OVER 1,X,Y: DRAW OVER
1,-A,-B
390 PLOT OVER 1,C,D: DRAW OVER
1,B,-5,-A,-5
400 LET X=127+R*(COS (P+2*PI))
LET Y=87+R*(SIN (P+2*PI))
410 LET C=127+R*(COS (P+1.55+2*
PI)): LET D=87+R*(SIN (P+1.55+2*
PI))
420 LET A=2*(X-127): LET B=2*(Y
-87)
430 IF A<5 AND A>-5 THEN LET A=
0
440 IF B<5 AND B>-5 THEN LET B=
0
450 GO TO 170
460 LET RA=RA+.01: GO TO 330
470 LET RA=RA-.01: GO TO 330
480 LET RT=RT+.01: GO TO 350
490 LET RT=RT-.01: GO TO 350
500 PLOT OVER 1,0,0: DRAW OVER
1,254,174: PLOT OVER 1,0,174: DR
AW OVER 1,254,-173
510 FLASH 1: PRINT AT 10,12;"DO
CKING": PRINT AT 11,11;"COMPLETE
D": FLASH D
520 FOR A=1 TO 15: BEEP .2,15:
BEEP .2,.20: NEXT A
530 CLS
540 LET J=INT J
550 LET L=L+J
560 PRINT
570 PRINT "YOUR SCORE WAS ";J;""
PARSECS"
580 PRINT : INVERSE 1: PRINT "Y
OUR CUMULATIVE SCORE IS ";L: PRI
NT . PRINT "ANOTHER SATELLITE ?"
INPUT RS: INVERSE 0
590 IF RS="Y" THEN GO TO 40
600 STOP
610 CLS : BEEP 2,5: INVERSE 1:
PRINT "YOU RAN OUT OF TIME": GO
TO 540
620 CLS : BEEP 2,5: INVERSE 1:
PRINT "YOU CRASHED INTO THE SATE
LLITE": LET J=0: GO TO 540

```

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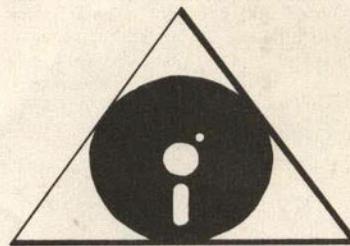
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LOADM"	RUN"	RUNM"
CHAIN"	APPEND"	DIR
INIT	CONFIG	KILL
ASSIGN	VERIFY	SELECT
COPY	BACKUP	CREATE
FLUSH	OPEN	CLOSE
FILES	END#	RESTORE#
DIM#	BOOT	INPUT
PRINT	FIND	BUILD
DO	IF EOF(x) THEN	

DELTA CARTRIDGE - contains DELTA Disk Operating System, User Manual, demonstration diskette.	£99.95
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- will dump the entire contents of your DRAGON 32 high-res screen to a high resolution printer. Can be used for design, display etc (see left). Available at present for EPSON printers only. Other modules to follow shortly.

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Waiting for Groucho

David Kelly lets Automata put some life in Street Life

"If there is such a thing as an alien, it doesn't want to come down to earth and get killed," observes Mel Croucher.

"I have yet to find an arcade game where there is a full trial at the start," rejoins Christian Penfold.

Automata could become one of the world's great double acts. Then again, they may not. But, they have — in their own words — found a niche for themselves in the games software business, somewhere between *Monty Python* and *Not the 9 O'clock News*.

For openers, there was *Can of Worms*, more recently *Pimania*, starring the infamous *Pi-man* himself, and soon there will be *Groucho*.

"Nobody else is in there doing the same kind of things as us — they are all still zapping aliens," says Mel.

"That's pathetic — and not at all what we are concerned with. Maybe it sounds trite, but we want to bring back something of the parlour game atmosphere and involve the whole family."

This is by no means the first venture for either Automata or its two founders. Mel has been an architect, bass-player in a rock band, and a cartographer. Christian has sold everything from motor cars to magazine space in his time. They have done, and still do, a lot of work for local radio stations — for a while they ran a company making audio promotions of foreign hotels for travel companies.

"That was one of our less successful ventures," says Mel. Christian shrugs: "We did one on the States just before Laker crashed, and we followed that up with one on Spain just before the pound plummeted!"

Automata started two years ago on a cross-Channel ferry back from just one such tourist guide venture.

"The entire world was throwing-up," recalls Mel with relish, "including Christian. I told him about the ZX81 I'd just bought to play with and he wasn't interested!"

Back on dry land, however, Christian was hooked — programming the Sinclair machine for 10 hours a day, seven days a week.

Christian is keen to point out that he has no responsibility for any of the ideas. He just keeps his head down, doing the coding: "I used to write poetry and my programming is just the same — unstructured," he points out helpfully.

Nevertheless, it is Christian who is the business brains. Says Mel: "My input is the idea and Christian makes it work. We are very interdependent on each other. We are the company. If we had 50 programmers they would all have to be clones of us — otherwise it wouldn't work."

"We are quite different," says Mel, indicating Christian: "He's somewhere to the right of Enoch Powell and I'm to the left

of Tony Benn. "That's why it works — otherwise we'd come in the morning and agree!"

Each of the Automata programs starts life as an elaborate story-board produced by Mel. First there was a tape called *Can of Worms* for the ZX81 which developed from a 20-page story-board and was condensed down to 1K by Christian.

In April last year the Spectrum was launched and it caught a great many software houses on the hop. "It certainly caused us to stop and think," says Mel. "And when we had thunk we brought out *Pimania*."

To Automata the program concept is more important and takes up much more time than the actual coding. "All the elements have come together with the computer," explains Mel. "I don't have to go and raise £1/4m to do a short film — we can do it here. Okay, so the animation is not up to Disney standard, but it is coming. I reckon we are up to the standard of the *Flintstones* cartoons now — static backgrounds with moving characters."

The idea behind *Pimania* was a treasure hunt — for a real prize, The Golden Sundial of Pi — worth £6,000. It can be won by solving the clues to be found inside the *Pimania* computer game. "The idea was like *Masquerade*," says Christian, "just less successful — we haven't sold 10 million copies!

"People are obviously worried that it hasn't been won yet — but the prize definitely exists! It hasn't been won because it is rather more than six or seven sentences. It's bloody hard to solve the puzzle — and for £6,000 it ought to be!"

And, on top of that, the *Pi-man* has become something of a cult figure. Says Christian: "He is an escape — an extension of our own personalities — all the nice and nasty bits rolled into one. But now he is no longer just exists in our minds. He is real. He has his own character."

Automata is now working on the next

project — *Groucho*. "Why Groucho? Because," says Mel, "Groucho Marx was a very funny man and he is a kind of salute to the world of entertainment."

In *Groucho* you have to travel the length and breadth of the USA — in the program of course — trying to discover where Groucho is playing each night. It is a world where the currency is cigars and life is a succession of pools, pool-halls, bars and casinos.

Hidden somewhere in the game is the identity of a famous Hollywood personality. Find the name and you win yourself a trip on Concorde to New York, £500 spending money, a chance to meet the famous star in Hollywood and a return trip on the QE2.

"*Groucho* has been aborted — maybe I should say reconceived — twice now. We planned to launch it in March but we threw it away. We shall only launch it when it is just right — it still hasn't quite got that 'Ting'!"

"It is not a typical adventure. We could have done the *Return of the Pi-man* — in fact he does get a guest appearance for all his expectant fans — but we wanted to do something different."

More than that neither Mel nor Christian will say. All will be revealed in the fullness of time.

"Earlier this year we hit a crisis when *Pimania* took off. In about February we had to put on the brakes and say 'No!' Mel holds up his hand. "Automata is just the two of us. If we expand too far we will lose everything — we will lose the driving wheel. You probably think we are just two boring old hippies — but we're not as daft as we look."

"Speak for yourself," interjects Christian, but Mel continues unabated: "I'm on my fourth time around and Christian is on his second. *Pimania* has been going eight months now. We think we know what we are doing and we are not going to blow it by get-rich-quick — like the one-hit wonders of the record industry."

"We have a drawer full of ideas — some good, some bad. Enough to last us for years."



Mel Croucher (left) and Christian Penfold

The mouth of the canon

Keith and Steven Brain delve into the Delta disc drive for the Dragon 32 from Premier Microsystems

For some considerable time the computer press has been full of rumours of the 'imminent' launch of a disc system from Dragon Data Ltd. But we are still waiting for the Dragon's creators to give him new fire, though a prototype was on display at the recent Earls Court computer fair (see opposite page).

In the meantime, independent entrepreneurs have not been idle and a number of alternative disc systems for the Dragon have also been promised. Whilst some of these systems are still only pipe-dreams, or prototypes, Premier Microsystems has actually reached the market with its *Delta* disc system, which is becoming widely available, particularly through the Computers for All dealer group.

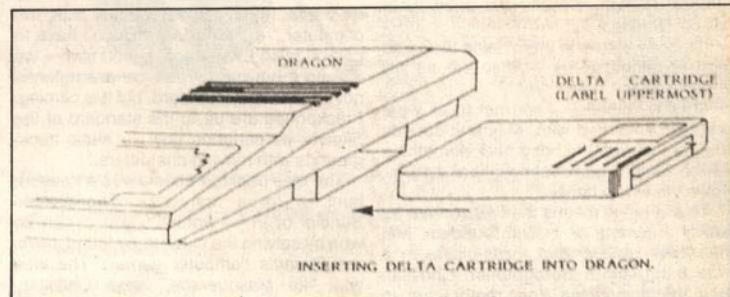
The heart of the system is a plug-in cartridge, containing the disc controller circuit, and the 8K Rom containing the *Delta* operating system. This external Rom approach means that very little of the standard 32K Dragon memory is reserved for system use, and thus unavailable to the user (1.8K).

The operating system is totally integrated with Dragon Basic, so that all normal commands function as usual. However, over 30 new or extended Basic commands are also added. These new facilities are as easy to use as the original Basic — 26 different clear and comprehensive disc error messages are generated when things start to go astray with your programs.

Although Premier supplies complete systems using the two-thirds height, 40-track Canon disc drives, the software can be configured to support virtually any available disc drives by the *Config* command, which needs six parameters (drive

letter, no of tracks, sectors/track, no of sides, step rate, data rate). The *Delta* controller cartridge is available alone at £99.95 for those with alternative preferences of disc, or perhaps source of supply. So, if you fancy some 3in MCD-1 miniature versions, or can lay your hands on some redundant 8in drives, then setting up is still simple.

Up to four drives can be supported and each of these can be configured separately, so you can even copy from one size to



INSERTING DELTA CARTRIDGE INTO DRAGON.

another. Both single and double density and single and double sided are supported.

At present, Premier is supplying *Delta 1* (single 40-track, single sided) at £299.95 and *Delta 2* (single 40-track, double sided) at £345.95, both using the single density Canon drives, but the literature specifies systems up to *Delta 8*, with two double-sided, double-density (80-track) drives for £679.95.

Delta 1 provides 100K of storage. This is doubled in *Delta 2*, to 200K, and if you really need the space two *Delta 8s* (or is that a 16?) will provide 1.6 megabytes! If

even that won't satisfy you, then a change to 8in discs will send you up to 2.5 megabytes, though why you are using a Dragon in such an application we can't really imagine.

Connection of the Premier system is very straightforward, as the controller simply plugs into the cartridge port (power off!!), the disc drive cable is connected, the Dragon is powered up, the *Delta* message appears in place of the usual Dragon Data line, and when any key is pressed it boots up. *Dir* will now list the first 14 items on the disc, giving filename, file type, and length in domains (1 domain = 256 bytes). To continue the directory listing, just press any key. Output can be redirected to the printer by means of a simple *Poke*. A mother board, which will allow multiple connec-

tions to the cartridge port, is promised and *Delta* can also be specified containing the Premier 'Encoder 09' two-pass assembler internally.

A 75 page A4 looseleaf manual is provided and, as adequate documentation can make or break a product, we are very pleased to be able to report that this is absolutely first-class. An errata sheet contained only eight corrections, and we did not find any other errors. The manual starts with an introduction to the *Delta* system and disc operations in general, which is obviously aimed at the novice. We particularly liked the line in bold type:

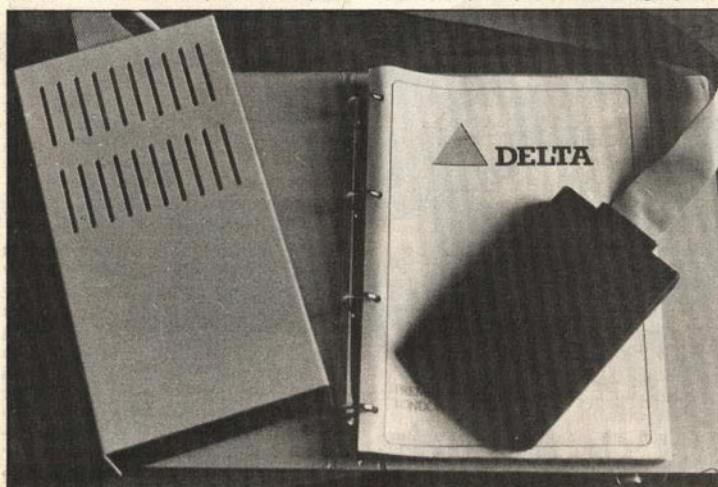
"REMEMBER >>> IF ALL ELSE FAILS,
READ THE MANUAL!! <<<"

Each *Keyword* is then explained in detail in a standard format:

- Function
- Syntax
- Examples
- Comments
- Associated keywords

Init is the formatting command and, as a precaution, it requires user confirmation before wiping used discs. In addition to being able to handle program files with *Save*, *Savem*, *Load* and *Loadm*, you can *Run* and *Rumm* which will load and auto-execute your programs. A quick comparison indicates that programs load about 10 times faster than from cassette.

Chain allows you to load a new program, but carry over variables from the old program. *Append* merges the program in the workspace with one on disc, although use of *Renumber* may be necessary as, if



line-numbers are identical, the disc line will overwrite the line in memory.

Assign has two functions. It allows you to rename files and it can also protect and unprotect files. Protected files cannot be erased with *Kill*, which otherwise deletes named files. A *Verify* operation is normally included as the default, but this can be disabled to speed up access where speed is the most important consideration.

Copy copies a named file from one disc to another, whilst *Back-up* copies the entire disc. These facilities are straightforward and user-friendly, even for the single-drive system we tested, although all the disc-swapping required to *Back-up* an entire disc on a single drive tends to make your arms ache! At this point you need to consider how valuable your time is and whether, if your particular applications require routine *Back-up* of data, the extra £145 required to provide 200K as two 40-track single-sided drives, rather than one 40-track double-sided drive, is a sound investment.

Use of *Boot* allows a disc to automatically carry out an instruction as soon as the disc is selected. It can be used to provide further software facilities, for example we used it to automatically provide an on-screen machine-code clock based on Ian Nicholson's program in the June 1983 edition of *Dragon User*. It is also a particularly useful feature for applications software to be used by untrained operators, as it can automatically set a process in motion when the disc is inserted. It can only contain one command, but this is not a problem as it can *Do* an executive file.

Build creates an executive file of up to 255 characters which can contain a series of commands. This saves itself to disc, when you press *Break*, with your chosen filename and the suffix *Bld*. *Do* " activates the file created with *Build*, and can thus set in motion a complex series of events.

Specified areas of memory can be stored as machine code files, so that machine code programs and graphics screens can be saved and reloaded. Extensions of this are *Runm* and *Exec* which allows you to execute from any address. The greater access speed of disc means that graphics screens can be loaded in seconds, an obvious asset in the educational and perhaps adventure game fields.

There is an extensive detailed section in the manual on data files, with a series of clear worked examples. Both serial and random files are supported. *Create* prepares the file and sets aside the specified disc space, while *Flush* clears a data file for re-use under the same name.

Files are *Opened* and *Closed* as in Microsoft Basic, but up to eight files may be *Open* at the same time. When more than one file is to be open simultaneously, *Files* is used to set aside buffer space in memory for each channel. *Print#* puts data into a file and *Input#* reads it back. *End#* moves the read/write pointer to the end of the serial file or random access

Dragon Data previewed its own disc system for the first time at the Earl's Court Computer Fair.

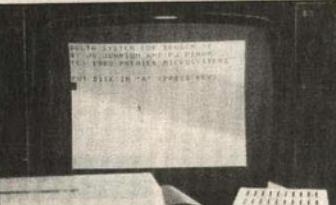
The half-height drive uses 5½ inch mini-diskettes, with a formatted memory capacity of 184.32K. The Discs are single-sided, double-density, with 40 tracks, 18 sectors per track and 256 bytes per sector.

The drive unit, with either single or double disc drives has a steel case and requires an external power supply. The single disc drive unit weighs 4.4kg.

The drives should be available in the summer. A single disc drive unit will cost £225 with a further £50 for the disc controller. Adding an extra disc to the single unit will be undertaken by Dragon dealers and cost £200.

Restore# resets the pointer to the start of the serial file, or random access record, and *If Eof(N) Then* has the normal error trapping function.

Dim# is an extension of the normal Basic command which allows you to set the length of a random access record. The default is the industry standard of 128 bytes, but it can be set to any value from 1 to 255 as required. This is very important for optimal use of memory and simple programming. The main difficulty with random access files is remembering on which record a particular item of data was stored, but this can be overcome with indexing,



where a small serial file provides an index for a large random access file.

A particularly useful and flexible command is *Find*, which will perform rapid comprehensive searches for a specified string. In a serial file, *Find* followed by *Input#* will input the target string from its start — and in a random access record will input the *Record* containing the string. As the search starts from the current file pointer position, this must be *Restored* for a complete search.

Random access searches start from a specified record number. Wild characters are allowed and are indicated with "*", so that partial matches can be easily searched for. For example, consider what *P*** ****** C***** W****** might turn up.

At around £300 the simplest disc system will set you back getting on for twice the new low price for the Dragon, so do you really need one and can it be worth the expense? Well, as always, that depends on what you want to do with your computer. If you are simply an arcade-games freak then just forget it, unless you have more money than sense, as the only

potential advantage is the ability to load up your favourite program faster. And even that is rather a vain hope, as most new machine-code software is heavily protected against copying.

The most obvious candidate for a Dragon disc system is the small business, where cassette files for data and/or text are not really a very practical proposition. When a customer is on the line asking if an item is in stock, he does not really want to know about the vagaries of your cassette loading, or wait for the record at the end of the tape to be reached — the rapid access to large databases available with disc is invaluable.

In addition to the business sector, increasing numbers of 'serious' hobbyists are beginning to consider that disc systems are not beyond their pockets. We are waiting impatiently for a disc-based word-processing system for the Dragon.

The question of how *Delta* will stand up against the competition must be very much to the fore, but in the continued absence of visible alternatives it must be getting a clear head start. Peter Rihan of Premier indicated that 60 percent of their sales so far have been complete systems, and claimed current sales/orders of 2000 units.

The *Delta* disc system is a very professional product and it looks as if Premier are going to support it properly. A nice touch, especially in view of the potentially large number of new disc users, is the Customer Service Session from 7 to 9 pm on Monday evenings when you can phone in with your problems. We tried this out, whilst seeking more information on the system and got a very helpful response.

In our opinion, *Delta* deserves to be a success, but that will also depend on how quickly commercial software becomes available for it. We understand that a number of software houses have taken an interest in the Premier system and that in particular MSD Consultants have some business programs ready. The longer other systems are delayed, the more likely it is that other programmers will write for *Delta* and that it's early beachhead will develop into a successful campaign. ■

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PROGRAMMING

Close to critical

Andrew Thompson presents five programs to help 'O' level pupils with their studies

With computers now an everyday part of our lives, they are being used in many different areas. One of these fields is education and, while the teacher will never be replaced, the computer serves as a useful tool.

Here are five, short, concise programs concerned with topics covered in schools at 'O' level. They are all scientific programs, demonstrating theories such as radioactive decay and refraction of light. In this sort of program, a common difficulty is the equation with many factors:

$$A=1/(B+C-D)$$

Any value can be found if all the others are known, the problem arises when the unknown value has not been isolated (ie, B, C, D). The following programs get round this by holding all possible combinations of

the equations. A student would be expected to isolate any particular value if required.

Refraction: This program demonstrates the connection between ingoing and outgoing rays of light when they pass through glass or plastic. It explains why things become distorted and water looks shallower than it actually is. The angle of incidence (I) and the angle of refraction (R) are linked by the equation:

$$N = \sin(I) / \sin(R) - \text{SNELL'S LAW.}$$

Where N = the refractive index, a constant for a particular material; eg, glass = 1.5.

Program notes

70 If no null input then re-enter values
65 & 67 Convert degrees to radians

80-100 Compute unknown value
115-117 Convert radians to degrees

Critical angle: Another program concerning light, it explains why light is reflected at a glass-air boundary if the angle of incidence is too great. This also relates to the refractive index. When a ray of light passing from a dense medium to a less dense medium exceeds the critical angle, the boundary ceases to be transparent and acts like an everyday mirror.

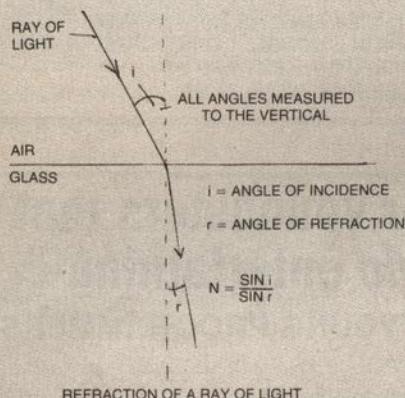
C=ARC SIN(1/N)

Program notes

90 Convert degrees to radians
100 Re-enter if no null input
110-120 Computer unknown value
130 Convert radians to degrees

Radioactive decay: When elements emit radiation, they decay at a constant rate with respect to their mass. The half-life of an element is the time taken for that element to decay to half its former mass.

This can be demonstrated in class by
Continued on page 19



REFRACTION

```

10 REM REFRACTION
20 PRINT "REFRACTION OF LIGHT IS GOVERNED"
30 PRINT "BY:"
40 PRINT "N=SIN(I)/SIN(R) - SNELL'S LAW"
50 PRINT "ENTER N,I,R,0=UNKNOWN VALUE"
60 INPUT N
62 INPUT I
64 INPUT R
65 LET I=3.1415*I/180
67 LET R=3.1415*R/180
70 IF (N*R*I)<>0 THEN GOTO 50
80 IF N=0 THEN LET N=SIN(I)/SIN(R)
90 IF I=0 THEN LET I=ASN(N*SIN(R))
100 IF R=0 THEN LET R=ASN(SIN(I)/N)
115 LET I=180*I/3.1415
117 LET R=180*R/3.1415
120 PRINT "N=",N
130 PRINT "I=",I
140 PRINT "R=",R
150 D=ABS(I-R)
160 PRINT "PATH DIFFERENCE",D

```

CRITICAL ANGLE

```

10 REM CRITICAL ANGLE.
20 PRINT "TOTAL INTERNAL REFLECTION OCCURS"
30 PRINT "WHEN LIGHT PASSES FROM A DENSE"
40 PRINT "MEDIUM INTO A LESS DENSE MEDIUM"
50 PRINT "AT AN ANGLE GREATER THAN THE"
60 PRINT "CRITICAL ANGLE. THIS EQUALS:-"
70 PRINT "N=1/SIN(C) C=CRITICAL ANGLE"
75 PRINT "ENTER N,C 0=UNKNOWN VALUE"
80 INPUT N
85 INPUT C
90 C=3.1415*C/180
100 IF (N*C)<>0 THEN GOTO 75
110 IF N=0 THEN N=1/SIN(C)
120 IF C=0 THEN C=ASN(1/C)
130 C=180*C/3.1415
140 PRINT "N=",N
150 PRINT "C=",C

```

READY.



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Navigate the sea to find the enemy with this high-resolution colour simulation. Engage enemy aircraft and ships who will try to torpedo and ram you. Depth charges and under-sea mines add to your problems. You are assisted by torpedoes, periscope view, radar/compass, fuel and depth gauges with on-screen displays of ammunition and score. Realistic explosions and sound effects alongside identification sheet, home-coming display, hall of fame and graphic reward for beating the high-score, makes this program a masterpiece. TRY IT!

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by Linda Hurley

The ZX81 computer is becoming ever more popular both in schools and homes, but in order to teach youngsters the techniques required to become proficient in programming the ZX81, they need instruction that will hold their interest and provide entertainment and enjoyment. This book, to be published in July, teaches young programmers from nine years upwards the fundamentals of BASIC programming in a way that they'll find both educational and exciting.

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PROGRAMMING

giving each pupil a number of dice. Then, the dice are thrown and all sixes are removed. This continues until all the dice are removed.

Program notes

80-90 Ensure valid input
130-150 Toss the dice
160-175 Report on population

Prime number: A number is said to be prime if it has no divisors other than itself and unity (1). The apparently random distribution of primes in the number sys-

tem still frustrates mathematicians. Checking for primes becomes tedious as numbers increase. This program divides a number by every number under its square root.

Program notes

65 Ensure valid input
70 Scan all numbers under the square root
100 Address for line 80

Equation of a line: A recurrent 'O' level maths topic is the establishment of the equation of a line on a graph. Many questions take the form of several points

on a graph where you have to work out another point.

In fact, only two points on a straight line are required to deduce the equation of the line. The program requests these two and computes the equation of the line joining the points. Try writing down two points, working out the equation and then checking with the computer.

Program notes

130 Calculate gradient
140 Calculate data zero

All the programs are written in standard Basic and are designed to run on most micros. ■

RADIOACTIVE DECAY

```
10 REM RADIOACTIVE DECAY
20 PRINT"THE RADIOACTIVE DECAY OF AN ELEMENT"
30 PRINT"CAN BE SIMULATED BY THROWING DICE AND"
40 PRINT"PROGRESSIVELY REMOVING ALL SIXES"
50 PRINT"THROWN."
60 PRINT"HOW MANY DIE TO BEGIN WITH"
70 INPUT D
80 LET D=ABS(INT(D))
85 LET R=0
90 IF D=0 THEN GOTO 60
120 R=R+1
130 FOR A=1 TO D
140 IF INT(6*RND(1)+1)=6 THEN LET D=D-1
150 NEXT A
160 PRINT"ROUND",R.
165 REM SCROLL IF ZX=81
170 PRINT"SIZE",D
175 REM SCROLL IF ZX=81
180 GOTO 90
READY.
```

PRIME NUMBER

```
10 REM PRIME TEST
20 PRINT"A NUMBER IS SAID TO BE PRIME"
30 PRINT"IF IT HAS NO DIVISORS OTHER"
40 PRINT"THEN ITSELF AND UNITY (1)"
50 PRINT"ENTER A NUMBER TO BE TESTED"
60 INPUT N
65 IF N<3 OR N>INT(N) THEN GOTO 60
70 FOR A=2 TO SQR(N)
80 IF N/A>INT(N/A) THEN NEXT:
PRINT"PRIME!":GOTO 100
90 PRINT"NOT PRIME.":A=SQR(N):
NEXT A
100 END
READY.
```

EQUATION OF A LINE

```
10 REM EQUATION OF A LINE
20 PRINT"A STRAIGHT ON A GRAPH"
30 PRINT"CAN BE EXPRESSED BY THE EQUATION"
40 PRINT"Y=M*X+C"
50 PRINT"IF TWO POINTS ON A LINE ARE KNOWN"
60 PRINT"THE EQUATION CAN BE CALCULATED."
70 PRINT"ENTER TWO POINTS (X,Y)"
80 PRINT"POINT 1"
90 INPUT X1
95 INPUT Y1
100 PRINT"POINT 2"
110 INPUT X2
115 INPUT Y2
130 M=(Y1-Y2)/(X1-X2)
140 C=Y1-M*X1
150 PRINT"Y="M"*X+C
READY.
```

Input error — nonsense in Basic

Ian Logan looks at syntax checking in the second of a five-part series

The three Sinclair machines — the ZX80, ZX81 and Spectrum — have proved to be very popular machines, and this success is partly due to the inclusion of 'syntax checking'.

To the user, the syntax checker appears to be that part of the operating system that stops faulty Basic lines being copied from the editing area at the bottom of the TV screen to the program area at the top of the screen. Indeed, when the syntax checker finds a mistake, a flashing question mark appears in the edit-line at a point where the syntax has failed. The user can then amend the Basic line and try to have it accepted a further time. Note that direct Basic lines are also checked for correct syntax before being executed.

The syntax checker is therefore concerned with the identification of 'syntax errors' in the edit-line and is called on every occasion the user leaves the editor by pressing the *Enter* key. In fact, the syntax checker is also called to check the syntax of the 'input-line' when the user is responding to an *Input* prompt.

So, what is the syntax checker actually doing? Well, this is a simple question, but the answer may appear far from simple unless the reader understands the difference between syntax errors and run-time errors.

A syntax error occurs when the computer finds that the user has entered a line that in some manner has failed to make sense. A run-time error occurs, however, when the computer finds that it cannot manage the task set by the user, not because the sense of the statement is not correct, but because the operating system just does not allow it. As a first example consider the statement: 10 LET =B that can be entered, using the editor, into the edit-line. But, when the *Enter* key is pressed, a syntax error is signalled. The mistake is one of 'syntax fails' because the user has not placed a variable between the 'Let' and the '='. The syntax checker 'insists' that in a Let statement the command word is followed by:

- characters that form a valid variable name, the character '='.
- characters that form an expression — numeric or string to match the type of variable used.
- either a 'carriage return' — end of the Basic line, or a ';' — end of the Basic statement.

and it is the checking for these four items that constitutes the task of the syntax checker when examining a Let statement.

If the user were now to change the statement to read: 10 LET A = B then the syntax of the Let statement would be satisfied. But, if the user executes this one line program by entering Run and

Enter the operating system will give a run-time error because it cannot find a suitable value for B. The system has been asked to do something that is just not allowed. It is of interest that, in some other microcomputers, such a statement does not give a run-time error, as the manufacturers have asked the system programmer to give 'undeclared' variables the value zero (for example).

In the Spectrum system, there are 50 different Basic commands, *Let*, *Run*, *Cls* ... and in the parameter table at 6778 (1A7Ah) to 6934 (1B16h) is to be found a corresponding set of parameter items for each of the commands.

In the case of the *Let* command, the entries are:

address dec	(hex)	entry dec	(hex)
6778	(1A7A)	1	(01)
6779	(1A7B)	61	(3D)
6780	(1A7C)	2	(02)

and from these entries the operating sys-

tem understands that the syntax for a *Let* command has to have the four 'conditions', as outlined earlier. This is performed in the following manner: the first entry — 01 — is collected once the operating system has determined that it is dealing with a *Let* command. This value signifies that the *Let* is to be followed by a variable, as this is the condition given in the *Class-01* subroutine at 7199 (1C1Fh) — called *Tem1* by Sinclair.

The scanning of the characters in the *Let* statement, that form the variable name, shows very nicely just what points are checked by the syntax checker and what is left alone. The first action of the *Class-01* subroutine is to call the *Look-Vars* subroutine — 10418 (28B2h) and called *Find_n* by Sinclair. This subroutine checks to see if the variable has the correct form.

The system variable *Ch_Add* is used as a pointer to each of the characters in the *Let* statement, as they are required. Bit 6 of the system variable *Flags* is set if the variable is of the numeric type and reset if string. The carry flag is always returned reset as syntax is being checked. If there should have been an error — such as the user submitting the line:

10 LET AB\$ = "" (where there are two letters before the \$)

Address	Name	Action
24 (0018h)	GET-CHAR	;The byte addressed by CH_ADD ;goes into the A register. ;Spaces and control codes are ;ignored.
32 (0020h)	NEXT-CHAR	;CH_ADD is advanced before ;GET-CHAR is called.
7293 (1C82h)	EXPT-1NUM	;The next number goes onto the ;calculator stack.
7308 (1C8Ch)	EXPT-EXP	;The next string expression ;goes onto the calculator stack.
7828 (1E94h)	FIND-INT1	;The number on the top of the ;calculator stack goes into the ;A register.
7833 (1E99h)	FIND-INT2	;Number to BC register pair.
9467 (24FBh)	SCANNING	;The next expression is ;evaluated — the result goes on ;the calculator stack.
11249 (2BF1h)	STK-FETCH	;A set of string parameters is ;taken off the calculator stack. ;BC = length, DE = base address.

then syntax will have failed at this stage. When this occurs, the user is 'returned' to the editor and the edit-line is printed with a flashing question mark at the point that *Ch_add* had reached when the error was identified.

The second entry — *3D* — is now considered. This code is the Ascii representation of the '=' character and is the 'separator' required at this stage. The code addressed by the system pointer *Ch_add* is compared to the '=' code. If they match, then the syntax condition is satisfied and *Ch_add* is advanced before proceeding to the next stage. However, if the codes do not match, then the user is returned to the editor.

The third and final entry — *02* — can now be used. This code indicates that the subroutine *Class-02* — 7246 (1C4Eh and *Tem2*) is to be called. This subroutine is a little complicated, but essentially there are two tasks to be performed:

- Scan the 'next expression' by calling SCANNING — 9467 (24FBh and EXPRN) to ensure that the characters form a meaningful expression.
- Match the 'type' of the variable to that of the expression, giving a syntax error if they are not both numeric or both string.

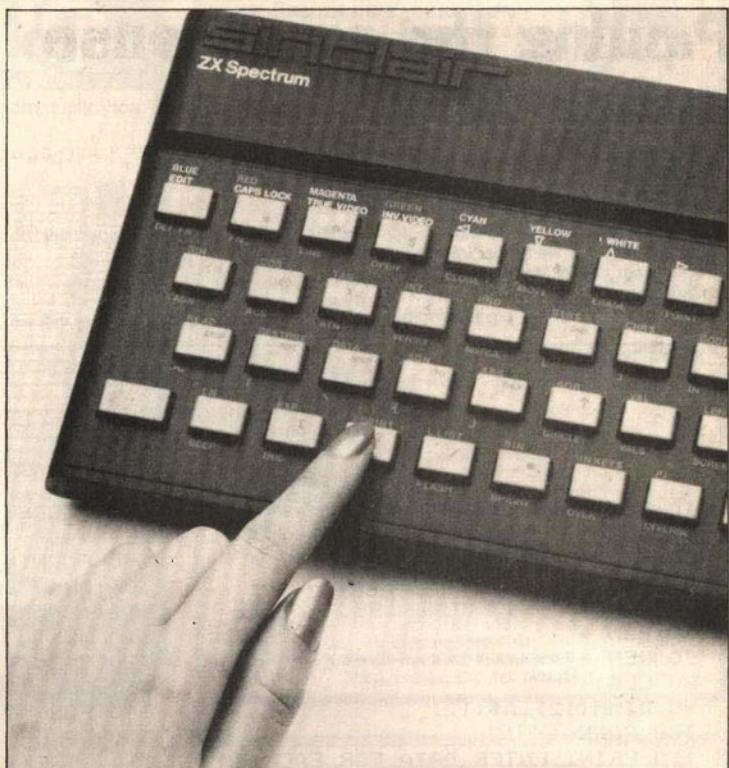
The only condition that remains to be handled is the requirement that the statement must now be at its end. This is done at the end of every statement — the subroutine *Check-end* — 7150 (1BEEh and *End?*) does no more than compare the character addressed by *Ch_add* against the characters 'carriage return' and '.'. If there is an error, the user is returned to the editor as usual. Otherwise, the syntax of the whole statement has been accepted and the operating system is ready to consider the 'next' statement. If there are no further statements, then the operating system allows the line to be accepted and used accordingly.

This discussion of the syntax checking procedure for a *Let* command shows that the syntax checker is only concerned with 'sense'. At no stage are variables created, values assigned, expressions evaluated or run-time errors considered.

There is, however, in the Spectrum system, a very special action undertaken by the syntax checker and that is the 'insertion of hidden floating-point forms' after numeric values as they occur in expressions. This operation is performed by the *Scanning* subroutine and makes the evaluation of expressions faster in runtime. It is interesting to note that if 'syntax fails' further along a line, then the floating-point forms have to be removed from the whole line before a 'return' is made to the editor.

The *Let* command uses two of the command class routines that are found in the Spectrum's operating system. Details of all the command classes are to be found in table 1.

The parameter table contains entries for all the Basic commands and, as a further example, the steps involved in handling a *Run* statement will now be outlined. The entries for *Run* are:



address dec	(hex)	entry dec	(hex)
6827	(1AAB)	3	(03)
6828	(1AAC)	161	(A1)
6829	(1AAD)	30	(1E)

In this case, the first entry shows that a numeric expression may follow — zero to be used in case of default'. The second and third entries form the address of the 'run-time command routine' and are not used in syntax time. The *Class-03* — 7181 (1C0DH and *Tem3*) contains the two steps:

- Call *FETCH-NUM* — 7390 (1CDEh and OPTNO) which in syntax time confirms that any characters that are present in the statement do indeed form a numeric expression.
- Check that the end of the statement has been reached.

These examples show how syntax is managed in the 'old' Spectrum Rom, but the mechanisms involved form an integral part of the operating system and it is difficult to use them in one's own programs. However, the 'shadow' Rom, of the microdrive/network/RS232 interface, includes a provision for extending the Basic interpreter, should the user so wish.

The 'shadow' system variable *Vector* — 23735 (5CB7h) — contains the vectored address to the end of the command-search in the 'shadow' Rom. This address may be changed by the user and further tests conducted before returning. Should one of the new tests indicate a certain condition, then this can be acted upon and,

in effect, a new Basic command added to the existing set.

As an example, let me show how the new command — *Cls#* — has been added to the existing set of Basic. This new command allows the user to 'clear the screen and revert to the original colours', ie white paper, black ink, etc.

In the command-search a test is made for the command *Cls*, realising that at this point the 'old' Rom would have handled this command word if it had been followed by a 'carriage return' or '.' character. Once found, the syntax time routine for *Cls* is entered. Here *Ch_add* is advanced and the 'present' character compared to the 'hash' code, ie 35 (23h). If the codes do not match, then there has been an error, otherwise the code is accepted and *Ch_add* advanced once again.

Now a check is made to ensure that the end of the statement has been reached — again an error if not. This stage now marks the end of the syntax checking and a 'return' is made, carefully, to the appropriate place in the 'old' Rom, so that the next statement can be considered.

It is envisaged that the 'adding' of new commands to the Spectrum's Basic, whilst perhaps never being particularly useful, will be taken up by many hobbyists as they vie to make toolkits, new languages and many other interesting programs.

In the next article, 'run-time' will be considered. ■



Putting the months into perspective

Ian Robertson presents a monthly barchart program complete with demonstration routine

Having just acquired a BBC Model B for use in school, I was most impressed by a program called *Monthly* among the demonstrations in the Users Guide. The following is an attempt to produce some-

thing similar (albeit not in perspective), on my true and trusted Dragon.

Program notes

Line 90 Dimension arrays to hold graph data and

strings to print the months on the hi-res screen.

- 100-180 Loop to input the data. For demonstration purposes this READ's the data rather than INPUT's it. The increment of M(N) in line 140 is to allow room for the months at the bottom of the hi-res screen. Line 160 prevents the DRAW instructions going out of range.
- 190-210 Loop to read data for month DRAW strings.
- 220-260 Stop and start instructions.
- 270-410 Calculate and draw the 'bars' in alternating colours. Lines 370-380 draw a box in the background colour in the same position as the filled boxes in order to separate the 'bars'.
- 420-470 Data for demonstration and month DRAW strings.

```

10 REM ****
20 REM *
30 REM *   DRAGON BARGRAPH. *
40 REM *   (C) IAN ROBERTSON *
50 REM *   12 JUNE 1983 *
60 REM *
70 REM ****
80 CLS
90 DIMM(12),A$(12)
100 FORN=1TO12
110 PRINT"ENTER DATA FOR EACH MONTH"
120 PRINT @64,"MONTH";N
130 REM*****
        TEMPORARY READ STATEMENT
        FOR DEMONSTRATION.
        REPLACE WITH 'INPUT'.
        AND DELETE DEMO DATA,
        (LINE430).
140 READM(N):M(N)=M(N)+10
150 REM*****
160 IFM(N)>191 THENM(N)=191
170 CLS
180 NEXT
190 FORN=1TO12
200 READA$(N)
210 NEXT
220 PRINT@98,"TO SEE GRAPH PRESS
spacebar"
230 PRINT@224,STRING$(32,"£")
240 PRINT@290,"spacebar AGAIN FOR NEW GRAPH"
250 SCRENO,1
260 IFINKEY$=="THEN260ELSE270
270 PMODE3,1:PCLS:SCREEN1,1
280 N=17
290 FORN1=1TO12
300 DRAW"BM"+STR$(N)+",191C7"+A$
(N1):N=N+20
310 NEXT
320 C=2:X=7
330 COLORC
340 FORN=1TO12
350 COLORC
360 LINE(X,182)-(X+20,191-M(N)),
PSET,BF
370 COLOR5
380 LINE(X,182)-(X+20,191-M(N)),
PSET,B
390 X=X+20:C=C+1
400 IFC>4THENC=2
410 NEXT
420 REM*****
        DEMONSTRATION DATA
430 DATA 123,3,73,187,69,100,57,
65,87,32,145,150
440 REM*****
        DATA FOR MONTH LETTERS
450 DATA BL4R3U8L2R4,U4NR1U4NR4,
BL4U8F4E4D8,BL4U4NR6U4R6D8,BL4U8
F4E4D8,BL4R3U8L2R4,BL4R3U8L2R4,B
L4U4NR6U4R6D8
460 DATA BL4R6U4L6U4R6,BL4R6U8L6
D8,BL4U8BD1F6BD1U8,BL4U8R4F2D5G2
L4
470 REM*****
480 IFINKEY$<>CHR$(32) THEN480ELS
ERUN

```

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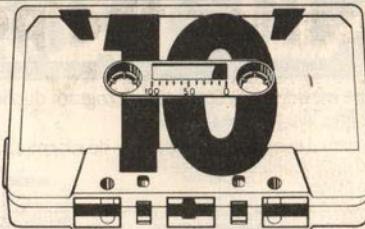
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Squaring the powers of the assembly

Jeremy Ruston explains how to compute powers of numbers in assembly language

As well as multiplication and division, it is fairly easy to take the powers of numbers in assembly language (for example, 2^2 to the power of 3 is two multiplied by itself three times which is eight. In Basic, this is 'Print 2^3 ').

There are several reasons why we should wish to be able to compute powers of numbers. A simple compiler or interpreter that only supports integer arithmetic can use this method to implement powers, without needing floating point arithmetic. I find the most common use of the power operator is to help in extracting bits from a byte.

In addition, many arithmetic and numerical analysis techniques require power calculations. For example, we shall examine how to compute X to the power of N , given X and N , and assuming N is a positive integer.

Let us assume we want to find X to the power of 16. We could start with X and multiply it by X 15 times. This is the obvious way to do it, but it is needlessly complex and slow. It is possible to obtain the same answer with only four multiplications,

as opposed to 15, if we repeatedly take the square of each partial result. This will yield the partial answers X^2 , X^4 , X^8 and X^{16} . This result is extracted from the basic laws of indices, which state that $(X^N)^M$ is the same as $X^{(N \cdot M)}$.

The same idea can be applied to any value of N in the following way:

- (1) Write the number N in binary, but omit any zeros on the left; ie, the first digit must be a 1.
- (2) Replace each 1 in the number by the pair of letters SX and replace each zero by the letter S.
- (3) Cross off any SX pairs that appear on the left.
- (4) The result is a sequence of the letters S and X. Oddly enough, this result can be used for computing X to the power of N .
- (5) S is interpreted as the operation of squaring and X is interpreted as the operation of multiplying by X .

For example, I shall work through the above method if N is equal to 23. The binary representation of 23 in 10111. This gives a letter sequence of SX S SX SX SX.

We can remove the leading SX to gain the answer S SX SX SX.

This rule states that we should square the number twice, then multiply by X , square it again, multiply by X , square it and then multiply by X . We would be successively computing X^2 , X^4 , X^8 , X^{16} , X^{11} , X^{22} and X^{23} . This binary method is pretty easy to translate into assembly language as long as you have a suitable multiplication routine, like those we have discussed previously.

A computer program to do all this often bears very little resemblance to the above algorithm. The method used to find X^N is as follows:

- (1) Set Y to 1 and Z to X .
- (2) Shift N right. If the bit that fell off was zero, go on to step 5.
- (3) Set $Y = Z * Y$.
- (4) If $N = 0$, the program has finished; the answer is Y .
- (5) Set $Z = Z * Z$.
- (6) Go back to step 2.

This can be encoded in a simple Basic program (see below).

You can trace through this program by hand to see exactly how the algorithm works. You may also like to encode the program into assembly language. If you decide to do so, I would recommend you stick a limit of one byte on the lengths of all the variables used.

This is an extract from *The BBC Micro Compendium*, available from 1 August, from Interface Publications, 44-46 Earls Court Road, London W8 6EJ.

```

10 REM POWER
20
30 REM Binary method for exponentiation
40
50 REM (c) 1983 Jeremy Ruston
60
70 INPUT "What do you want to the power of what:"Z,N
80
90 REM Step 1:
100 Y=1
110
120 REM Step 2:
130 N=N/2
140 IF N=INT(N) THEN GOTO 230
150 N=INT(N)
160
170 REM Step 3:
180 Y=Z*Y
190
200 REM Step 4:
210 IF N=0 THEN PRINT "Answer:"Y:END
220
230 REM Step 5:
240 Z=Z*Z
250
260 REM Step 6:
270 GOTO 120

```

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Dragman

on Dragon

This game resembles Pacman. The program uses the two different speed modes in the processor (do not use fast unless you are sure your Dragon can handle it). The game consists of three Ghosts, three

Dragmen and four Power pills.

The game will become progressively harder. Many Dragon owners have been wondering how to achieve continuous movement by using *Inkey\$*. I have managed this by introducing another variable.

Program notes

10-60 Rem lines
70 Game type and instruction

80-120	Variables
130-310	Set up screen
320-530	Movement
540-710	Ghosts movement
720-800	Screen Data
810-850	Routine for dead Dragman
860-1130	Chase
1140-1250	End
1260-1520	Increase speed and instructions
1530-1580	Game Type

Variables

NS=	Sheet number
DL=	Dragmen left
SC=	Score
HI=	High
HIS=	Highest scorer
G1,2,3=	Three ghosts position
X=	Position of Dragmen
XG=	Game type

```

10 REM *****
20 REM *** DRAGMAN BY ***
30 REM *** SIMON GREEN ***
40 REM *** (C) 12/2/83 ***
50 REM *** BK PROGRAM ***
50 REM *****
70 GOSUB 1530:GOSUB 1320
80 REM *** VARIABLES ***
90 TG$="G":NS=1:HIS$="DRAGON"
100 DIM BS(463):PL=3:HT=5000
110 BS(100)=3:BS(122)=3:BS(356)=3:BS(378)=3:BS(335)=4:
    BS(238)=5:BS(239)=5:BS(240)=5
120 G(1)=239:G(2)=239:G(3)=240:X=335
130 REM *** SET UP GAME ***
140 FOR F=63 TO 415 STEP 32:BS(F)=1:NEXT F:CLS
150 FOR SD=1 TO 184:READ SN:BS(SN)=1:PRINT SN,CHR$(
    (175)::NEXT SD
160 PRINT BS(1),"G":PRINT BS(2),"G":PRINT BS(3),"G":
    :PRINT BS("C")
170 IF BS(100)=3 THEN PRINT 8100,"0";
180 IF BS(122)=3 THEN PRINT 8122,"0";
190 IF BS(356)=3 THEN PRINT 8356,"0";
200 IF BS(378)=3 THEN PRINT 8378,"0";
210 FOR SD=64 TO 414
220 IF AA=1 THEN IF BS(SD)=0 OR BS(SD)=1 OR BS(SD)=3 OR
    BS(SD)=4 OR BS(SD)=5 THEN 250
230 IF BS(SD)=1 OR BS(SD)=3 OR BS(SD)=4 OR BS(SD)=5
    THEN 250
240 BS(SD)=2:PRINT BS(0),"*";
250 NEXT SD
260 PRINT 80,"score=";SC::PRINT 813,"hi=";HI::PRINT 823,
    "lives";PL;
270 PRINT 8453,"dragman by simon green";
280 PRINT 8482,"sheet=";NS;
290 PRINT 863,"h":PRINT 895," ";:PRINT 8159,"x";
300 FOR F#1 TO LEN(HIS$):PRINT 8F*32+159:Mid$(HIS$,F,1):
    :NEXT F
310 PRINT 8F*32+159;"x";
320 REM *** MOVE DRAGMAN ***
330 ZZ$=INKEY$
340 IF ZZ$="" THEN ZZ$=Q$%
350 IF ZZ$=CHR$(9) THEN X1=1
360 IF ZZ$=CHR$(8) THEN X1=-1
370 IF ZZ$=CHR$(94) THEN X1=-32
380 IF ZZ$=CHR$(10) THEN X1=32
390 X=X+X1

```

PROGRAM OF
THE WEEK

```

400 IF X=463 THEN PRINT 8431," ";:X=47:GOTO 440
410 IF X=15 THEN PRINT 847," ";:X=431
420 IF BS(X)=1 THEN X=X-1:GOTO 530
430 PRINT BX-X1," ";
440 PRINT BX,"C";
450 QS=ZZ$
460 IF BS(X)=2 THEN SC=SC+10:PRINT 86,SC::BS(X-X1)=0:
    SOUND 220:TG,1:ND=ND+1:IF ND=213 THEN 1250
470 IF SC=2000 AND KK=0 THEN PL=PL+1:PRINT 829,PL:
    :GOTO 490
480 GOTO 500
490 FOR F=1 TO 5:PRINT 8492,"extra dragman";:FOR F1=1
    TO 200:NEXT F1:PRINT 8492," ";:FOR F1=1 TO 200:NEXT
    F1:F:KK=1
500 IF RS(Y)=T THEN RS=Y+40:PRINT 8F,RS::RS(X-X1)=0:
    BS(X)=0:PLAY "03T30CDEFGFEDCDEFG":ND=ND+1:IF ND=213
    THEN 1250 ELSE 860
510 IF G(1)=X OR G(2)=X OR G(3)=X THEN 810
520 BS(X)=0
530 FOR U=1 TO NS:GOSUB 540:NEXT U:GOTO 330
540 REM *** MOVE GHOSTS ***
550 FOR J=1 TO 3
560 RM=RND(4)
570 IF RM=1 THEN MG=-32
580 IF RM=2 THEN MG=1
590 IF RM=3 THEN MG=32
600 IF RM=4 THEN MG=-1
610 G(J)=G(J)+MG
620 IF G(J)=15 THEN PRINT 847," ";:G(J)=431
630 IF G(J)=463 THEN PRINT 8431," ";:G(J)=47:PRINT 8G(J),
    TG$;
640 IF BS(G(J))=1 THEN G(J)=G(J)-MG:GOTO 710
650 PRINT 8G(J),TG$;
660 IF BS(G(J)-MG)=2 THEN PRINT 8G(J)-MG,"*":GOTO 690
670 IF BS(G(J)-MG)=3 THEN PRINT 8G(J)-MG,"0":GOTO 690
680 BS(G(J)-MG)=0:PRINT 8G(J)-MG," ";
690 IF G(J)=X AND OO=0 THEN 810
700 IF G(J)=X THEN SC=SC+(100*NS):PRINT 86,SC::PRINT
    8G(J)," ";:G(J)=237+J:PLAY "03T30CDCDC":X=335:QS=""
710 NEXT J:RETURN
720 REM *** SCREEN DATA ***
730 DATA 32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,48,
    49,50,51,52,53,54,55,56,57,58,59,60,61,62,64,68,69,
    73,78,80,85,89,90,94
740 DATA 96,98,103,107,108,110,112,114,115,119,124,126,

```

Continued over the page

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```

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750 DATA 160,162,170,174,175,176,180,188,190,192,196,
    197,199,200,204,210,214,215,217,218,222
760 DATA 224,226,231,232,234,235,236,242,243,244,246,247,
    252,254
770 DATA 256,260,261,263,264,268,274,278,279,281,282,
    286,288,290,298,302,303,304,308,316,318
780 DATA 320,324,325,327,329,332,338,341,343,345,346,350,
    352,354,359,363,364,366,368,370,371,375,380,382,384,
    388,389
790 DATA 393,398,400,405,409,410,414,416,417,418,419,420,
    421,422,423,424,425,426,427,428,429
800 DATA 430,432,433,434,435,436,437,438,439,440,441,442,
    443,444,445,446
810 REM *** DRAGMAN CAUGHT ***
820 PL=PL-1:DO=0
830 RESTORE:PRINT 0X,"c":AA=1
840 PLAY"03T3GFEDC"
850 IF PL=0 THEN PRINT 029,PL:GOTO 1140 ELSE 0$="":
    GOTO 120
860 REM *** CHASE GHOSTS ***
870 DO=1:TG$="g"
880 FOR U=1 TO 160/NS/2:FOR F=1 TO NS:GOSUB 540:NEXT F
890 ZZ$=INKEY$
900 IF ZZ$="" THEN ZZ$=0$
910 IF ZZ$=CHR$(9) THEN X1=1
920 IF ZZ$=CHR$(8) THEN X1=-1
930 IF ZZ$=CHR$(94) THEN X1=-32
940 IF ZZ$=CHR$(10) THEN X1=32
950 X=X+X1
960 IF X=463 THEN PRINT 0431," ":"X=47:GOTO 1000
970 IF X=15 THEN PRINT 047," ":"X=431
980 IF BS(X)=1 THEN X=X-X1:GOTO 1120
990 PRINT 01-X1," ":";
1000 PRINT 0X,"c":
1010 GS=ZZ$
1020 IF BS(X)=2 THEN SC=SC+10:PRINT 06,SC:BS(X-X1)=0:
    SOUND 220/TG,1:ND=ND+1:IF ND=213 THEN 1260
1030 IF SC>8000 AND KK=0 THEN PL=PL+1:PRINT 029,PL:GOTO 1050
1040 GOTO 1060
1050 FOR F=1 TO 5:PRINT 0492,"extra dragman":FOR F1=1 TO 200:NEXT F1:PLAY 0492,"":FOR F1=1 TO 200:NEXT F1:F:KK=1
1060 IF BS(X)=3 THEN SC=SC+40:PRINT 06,SC:BS(X-X1)=0:
    PLAY"03T30CDCDC":ND=ND+1:IF ND=213 THEN 1260
1070 IF G(1)=X THEN SC=SC+(100*NS):PRINT 06,SC:PRINT 0G(1)," ":"PLAY"03T30CDCDC":G(1)=239:BS(X)=0:
    X=335:Q$=""
1080 IF G(2)=X THEN SC=SC+(100*NS):PRINT 06,SC:PRINT 0G(2)," ":"PLAY"03T30CDCDC":G(2)=239:BS(X)=0:
    X=335:Q$=""
1090 IF G(3)=X THEN SC=SC+(100*NS):PRINT 06,SC:PRINT 0G(3)," ":"PLAY"03T30CDCDC":G(3)=240:BS(X)=0:
    X=335:Q$=""
1100 PRINT 0X,"c":
1110 BS(X)=0
1120 NEXT U
1130 DO=0:TG$="G":Q$="":GOTO 320
1140 REM *** GAME ENDS ***
1150 FOR F=1 TO 1000:NEXT F
1160 IF SC>HI THEN HI=SC:JJ=1
1170 CLS:PRINT"YOUR SCORE=":SC
1180 PRINT:PRINT"HIGHEST SCORE SO FAR=":HI
1190 IF JJ=1 THEN PRINT:INPUT"ENTER YOUR NAME":
    HS$:ELSE 1210
1200 IF LEN(HS$)>8 THEN PRINT:PRINT"NAME TOO LONG":
    PRINT"MAX LENGTH=8 LETTERS":GOTO 1190
1210 PRINT:PRINT"ANOTHER GAME (Y/N)"
1220 AG$=INKEY$:IF AG$="" THEN 1220
1230 IF AG$="Y" THEN RESTORE:SC=0:KK=0:AA=0:NS=1:ND=2:
    PL=3:JJ=0:Q$="":GOSUB 1530:GOTO 110
1240 IF AG$("N") THEN 1220
1250 END
1260 REM *** NEW SHEET ***
1270 CLS:PRINT 0140,"WELL DONE":PRINT 0200,"SHEET"
    :NG="COMPLETED"
1280 NS=NS+1:PRINT 0262,"GET READY FOR SHEET":NS
1290 FOR F=1 TO 4000:NEXT F
1300 RESTORE:AA=0:ND=0:TG$="G"
1310 DO=0:GOTO 110
1320 REM *** INSTRUCTIONS ***
1330 CLS:PRINT
1340 PRINT TAB(12); "draugman":PRINT:PRINT" YOU 'D"
    TRAVEL INSIDE A MAZE TRYING TO GOBBLE UP AS MANY
    DOTS AS YOU CAN."
1350 PRINT" WHILST DOING THIS 3 GHOSTS WANDER AROUND
    HOPING TO CATCH YOU."
1360 PRINT" IF ONE OF THEM CATCHES UP WITH YOU, YOU LOSE
    A LIFE."
1370 PRINT" BUT IF YOU EAT A POWER PILL 'O' THEN FOR A
    LIMITED TIME YOU CAN CHASE THEM."
1380 PRINT:PRINT" PRESS 'Z' TO CONTINUE."
1390 ZC$=INKEY$:IF ZC$("Z") THEN 1390
1400 CLS:PRINT:PRINT" WHEN YOU EAT A POWER PILL THE
    GHOSTS WILL CHANGE FROM A 'G' TO A 'g'."
1410 PRINT" IF YOU ENTER THE TUNNEL YOU WILL APPEAR ON
    THE OPPOSITE SIDE."
1420 PRINT" THERE IS AN UNLIMITED NUMBER OF SHEETS BUT
    EACH ONE IS HARDER THAN THE PREVIOUS."
1430 PRINT" IF YOU EXCEED 8000 POINTS YOU THEN RECEIVE
    AN EXTRA DRAGMAN."
1440 PRINT" YOU USE THE CURSOR KEYS TO MOVE THEN
    DRAGMAN."
1450 PRINT:PRINT" PRESS 'Z' FOR SCORING TABLE"
1460 ZC$=INKEY$:IF ZC$("Z") THEN 1460
1470 CLS:PRINT:PRINT TAB(9); "scoring table":PRINT:PRINT
    TAB(9); "* = 10 POINTS":PRINT
1480 PRINT TAB(9); "0 = 40 POINTS":PRINT
1490 PRINT" g = 100 POINTS X SHEET NO."
1500 PRINT:PRINT:PRINT" PRESS 'Z' TO START GAME....";
1510 ZC$=INKEY$:IF ZC$("Z") THEN 1510
1520 RETURN
1530 REM *** TYPE OF GAME ***
1540 CLS:PRINT:PRINT"1. ORDINARY":PRINT"2. FAST"
1550 PRINT:INPUT"ENTER TYPE OF GAME (1 OR 2)":TG
1560 IF TG<1 AND TG>2 THEN 1550
1570 IF TG=1 THEN POKE 65494,0 ELSE POKE 65495,0
1580 RETURN

```

Dragman
by Simon Green



for LYNX, DRAGON, SPECTRUM
and ZX81 Software

MONSTER MINE by W. E. MacGowan. Escape from the mine with as much money as you can, but don't get clipped in or caught by the prowling monsters. An addictive machine code game, with superb graphics and save facility. Price (LYNX and DRAGON) £7.95. Price (SPECTRUM and ZX81) £4.95.

SULTAN'S MAZE by Christopher Hunt. Enter the 3D Maze in search of the Sultan's jewels, but beware, your strength may run out, or, you may come face to face with the Mad Guardian. A multi-difficulty game with fantastic graphics and sound. Price (LYNX and DRAGON) £7.95.

CHARACTER GENERATOR by John Line. A program for the programmer, allowing creation and saving of character sets/shape tables and subsequent inclusion into users basic program. Demonstration program and full ASCII character set included. Price (DRAGON) £9.95.

GEMPACK IV by W. E. MacGowan. Two great machine code games, with full colour graphics. In *Sea Harrier* you must land your plane on the aircraft carrier, after dispersing the clouds with chemical bombs, but don't hit the ship! In *Sub Chase* you must depth charge the wolf pack without being sunk. Both with four levels of play from easy to kamikaze! Price (LYNX and DRAGON) £7.95.

CHATEAU by Pete Allen. A new type adventure, in which you must wander the Count's old mansion in search of treasure! Of course, when the Count died and hid his treasure, he also left lots of unpleasant surprises for those brave enough to try and seek out his riches! Come face to face with Ghouls and Ghosts, Vampires and Trolls; do you run or fight? Will the mysterious Travel Agent suddenly appear and whisk you away to far off places? Where can you find the key or the lamp? Is the clock booby-trapped? Will you die a cold and lonely death, or will you win through to claim the fantastic treasures of The Chateau? Price (DRAGON) £7.95.

GAMES PACK III by Christopher Hunt.

REVERSI. Put your wits against the Lynx with this easy to learn, yet extremely demanding board game. Five skill levels, from novice to grand master.

SNAKE. Guide the snake to the food, but watch out, he will grow and must not eat the wall or himself.

PONTOON. An excellent implementation of a favourite card game in full colour with sound. Lynx is a mean Banker. Price (LYNX) £7.95.

LYNX COMPUTING BOOK by Ian Sinclair. Excellent book, which the beginner will find an invaluable aid, in helping to unravel the LYNX'S many varied features! Price £6.95.

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ZION ATTACK	OVERTAKE	RATS
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OPEN FORUM

Alpha Chase

on Spectrum

This program is a version of the game where the object is to steer an arrow around the screen, hitting each letter of the

alphabet in turn. If you run into the edge of the screen or any letter out of turn, then you lose one of three lives.

The game will run on either 16 or 48K machines. Although simple in design, after the first few levels it runs so quickly that it is, in fact, quite difficult to play.

Program notes

5	Set up the four arrows
10	Turn on caps lock; call 'print instructions'
20-30	Set up variables
40-90	Print Display
100-140	Main loop; move player etc.
200-260	Check what hit; move up a level
300-300	Lose a life; restart game
400-500	Print instructions

ALPHA CHASE
© P VESSEY 1983

```

5 RESTORE : FOR A=USR "A" TO
USR "D"+7: READ B: POKE A,B: NEX
T A: DATA 0,16,56,124,16,16,16,0
0,8,12,126,12,8,0,0,16,16,16,
124,56,16,0,0,16,48,126,48,16,0
0
10 POKE 23658,6: GO SUB 400
20 LET DIFF=0: LET LIVES=3
30 LET CHR=65: LET A$=" "
40 BORDER 1: POKE 23693,6: CLS
50 FOR A=0 TO 7 STEP 2: PLOT A
,A: DRAW 255-2*A,0: DRAW 0,175-A
,A: DRAW -255+2*A,0: DRAW 0,-175
,+2*A: NEXT A
60 PRINT #1;AT 0,0; INK 6; BRI
GHT 1;"LETTERS": AT 0,22;"LIVES:
":LIVES
70 LET X=10: LET Y=15: LET X1=
-1: LET Y1=0
75 DIM X(26): DIM Y(26)
80 GO SUB 150: FOR A=1 TO 20:
BEEP .005,A: PRINT AT A,Y;"": N
EXT A: PRINT AT X,1;
90 PRINT AT X,Y; INK 5,A$: PRI
NT FLASH 1; INK 7;AT X(1),Y(1);"
A": BEEP 1,40: BEEP 1,-20
100 BEEP .01,0: PAUSE (11-DIFF)
: LET I$=INKEY$: LET X2=X: LET Y
2=Y: IF I$="S" OR I$="8" THEN LE
T Y1=I$-(I$="8")-1:I$="S": LET X1=0
: LET A$="+" AND I$="S")+(+" " A
ND I$="8")
110 IF I$="6" OR I$="7" THEN LE
T X1=(I$="6")-(I$="7"): LET Y1=0
: LET A$="+" AND I$="7")+(+" " A
ND I$="6")
120 LET X=X+X1: LET Y=Y+Y1: IF
X>1 OR X>20 OR Y<1 OR Y>30 THEN
GO TO 310
125 IF SCREEN$(X,Y)<>" " THEN
GO SUB 200
130 PRINT INK 5;AT X2,Y2;" ";AT
X,Y,A$
140 GO TO 100
150 FOR D=0 TO DIFF+5: PRINT AT
INT (RND*18)+2,INT (RND*28)+2;
": NEXT D: FOR A=65 TO 90
160 LET R1=INT (RND*18)+2: LET
R2=INT (RND*28)+2
170 IF R1=X OR R2=Y THEN GO TO
160
180 PRINT INK 7;AT R1,R2;CHR$ A
: BEEP .01,A/2: LET X(A-64)=A:
LET Y(A-64)=R2
190 NEXT A: RETURN
200 IF SCREEN$(X,Y)<>CHR$ CHR
THEN GO TO 300
210 PRINT #1; INK 6; BRIGHT 1;A
T 1,0+(CHR-65);CHR$ CHR
220 LET CHR=CHR+1: IF CHR>91 T
HEN PRINT FLASH 1; INK 7;AT X(CH
R-64),Y(CHR-64);CHR$ CHR: RETURN

```

```

230 PRINT INK 5;AT X2,Y2;" ";AT
X,Y,A$: FOR A=0 TO 40: BEEP .01
,A: BEEP .01,40-A: NEXT A
240 PRINT FLASH 1; PAPER 1;AT 9
4;" ** LEVEL ";DIFF/2+1;" COMPLE
TED **"
250 LET DIFF=DIFF+2: IF DIFF>10
THEN LET DIFF=0
260 FOR A=0 TO 40: BEEP .01,A:
BEEP .01,40-A: NEXT A: GO TO 30
300 REM ** HIT ONE **
310 PRINT INK 5;AT X2,Y2;" ";P
APER 1; INK 6; FLASH 1;AT 9,10;" "
LOSE A LIFE
320 FOR A=1 TO 20: PRINT INK 6;
PAPER 2;AT X,Y;SCREEN$(X,Y): BEEP
.02,-20: PRINT INK 2; PAPER
6;AT X,Y;SCREEN$(X,Y): BEEP .01
,0: NEXT A
330 LET LIVES=LIVES-1: IF LIVES
>-1 THEN GO TO 30
340 FOR A=0 TO 40: BEEP .01,A:
BEEP .01,40-A: NEXT A
350 PRINT FLASH 1; PAPER 1;AT 9
," GAME OVER"
360 PRINT INK 7;AT 11,4;" PRESS
ANY KEY TO PLAY"
370 IF INKEY$<>"" THEN GO TO 38
380 IF INKEY$=>"" THEN GO TO 380
390 GO TO 20
400 BORDER 0: POKE 23693,6: CLS
410 PRINT TAB 10;"ALPHA CHASE"
420 PLOT 79,169: DRAW 90,0: DRA
W 0,-12: DRAW -90,0: DRAW 0,12:
PLOT 77,171: DRAW 94,0: DRAW 0,-
16: DRAW -94,0: DRAW 0,16
430 PRINT AT 4,0;"The object of
the game is to collect each
letter, alphabetic-ality, by runn
ing into each in turn."
440 PRINT "If you hit the bord
er, a mine or any letter out of s
equence, then you will lose 1 of 3
lives. The next letter in the
sequence will flash to indicate i
ts position."
450 PRINT "Controls:"
460 PRINT TAB 2;"S: Left";"D:
Down";TAB 2;"A: Right";"W: Up"
470 PRINT PAPER 1;INK 6;FLA
SH 1;AT 21,2;">> PRESS ANY KEY T
O PLAY <>"
480 IF INKEY$<>"" THEN GO TO 48
490 IF INKEY$=>"" THEN GO TO 490
500 RETURN
GRAPHICS:
+=GRAPHIC A
+=GRAPHIC B
+=GRAPHIC C
+=GRAPHIC D

```

Alpha Chase
by Patrick Vessey

OPEN FORUM

Diamond Strikes Back

on BBC

This is another version of 'Space Invaders' which has been written for the BBC Model B. The object of the game is to shoot the diamond which drops down from the top of the screen. You man the space station at

the bottom of the screen and the object is to shoot it as many times as possible in the set time (200 units). Instructions are included in the program listing.

Program notes

Lines

10-50	The instructions
60	Set variables to 0
70-100	Define characters:

240	The diamond
241	The missile
242	The space station
243	The destroyer sign
110	Get rid of the cursor
130-220	Movement of the diamond
230-370	Space station's movement
380-460	Fire missile and check for hit
470-500	Telling you that you've hit
510-540	Giving comments and ending (or starting again)

```

10 MODE7:PRINTTAB(3,6)CHR$(141)"DIAMOND
STRIKES BACK":PRINTTAB(3,7)CHR$(
141)"DIAMOND STRIKES BACK"
20 PRINT:PRINT:PRINT:PRINT
30 PRINT "RIGHT":PRINT "LEFT":PRINT
40 PRINT "Z FIRE":PRINT
50 PRINT "PRESS A KEY TO BEGIN...":;
Z$=GET$
60 MODE4:Q=0:X=0:B=0:AA=0:QQ=0:Y=0:T=0:
SC=0
70 VDU 23,240,24,36,66,129,129,66,36,24
80 VDU 23,241,24,24,24,24,24,60,90,153
90 VDU 23,242,24,60,90,153,255,219,165,
255
100 VDU 23,243,170,85,170,85,170,85,170,
85
110 VDU 23,8202;0;0;0;
120 VDU 19,3,6,0,0,0,19,0,7,0,0,0,0
130 FF% = RND(4): IF FF% = 0 THEN 130
140 IF FF% = 1 THEN AA = AA + 1: IF FF% = 2 THEN
AA = AA - 1
150 IF FF% = 3 THEN AA = AA + 2: IF FF% = 4 THEN
AA = AA - 2
160 PRINTTAB(AA,00)CHR$240:SOUND 1,20,
-15,1
170 Q=0:Q=1
180 PRINTTAB(X-1,B-1)
190 FOR SS=1 TO 200:NEXTSS
200 X-AA:B=QQ
210 IF AA<3 OR AA>35 THEN AA=10
220 IF QQ>20 THEN QQ=0:AA=RND(20)
230 A$=INKEY$(10)
240 IF A$=". " THEN Y=Y+1:SOUND 1,-14,25,2
250 IF A$=", " THEN Y=Y-1:SOUND 17,-14,25,2
260 IF A$="Z" THEN SOUND 0,-14,40,2:
PROC FIRE
265 IF Y<3 OR Y>33 THEN PRINTTAB
(Y-2,20)":Y=10
270*FX 15,1

```

Piano

on Vic 20

This program works just like the Vic piano program in the Vic user manual except it also draws a staff on the screen and pokes the notes on it as you play. The program is very simple to use and can be a great help

for young or old students, who are taking their first steps on the musical path.

Keys 1-8 work like piano keys, but key 9 silences the Vic and clears the staff of notes.

You can change to another voice by altering the voice number in lines 65 and 230. Do not reassign the variable D in lines 140-210 to change octaves because the

screen poke is based on this variable. For example, if you intended to convert a G to a C you would still get a G on the screen.

Program notes

Lines

10-50	Sets up the display
60-100	Pokes notes on screen
100-310	Reads the keyboard — sound routine

```

8 REM ****
1 REM * (C)1982 *
2 REM * G.K. BIRGISSON*
3 REM * CELAND *
5 REM ****
6 REM
18 PRINT "J":"00000"
20 POKE36879,8
30 FORR=1TO5
40 PRINT "#"
50 NEXT
54 REM ****
55 REM # DRW NOTES #
56 REM ****
60 IFP21THENP=0:GOT010
65 GETA:IFR=0THENPOKE36876,0
66 IFR=0THENH65
70 X=7956-(#*22)+P
80 POKEX,81:POKEY,38728,7
88 IFPOKEX=21THENPOKEX=22,72:POKEY=22+38728,3
100 IFPOKEY=21THENPOKEY=22,71:POKEY=22+38728,3

```

```

105 REM ****
110 REM # SOUND #
120 REM ****
130 POKE36878,15
140 IFR=1THENH=135
150 IFR=2THENH=147
160 IFR=3THENH=159
170 IFR=4THENH=163
180 IFR=5THENH=175
190 IFR=6THENH=183
200 IFR=7THENH=191
210 IFR=8THENH=195
220 IFR=9THENPOKE36878,0:P=0:GOT010
230 POKE36876,D
238 D#P,R#P,P#+2
310 GOT068

```

Piano
by B Bugisson

Mole Attack

on ZX81

This is a fast moving game for the 16K machine. In your garden there are 80 moles. You must rid your garden of moles, but you only get one shot at each mole. There are nine mole holes in the garden, and the moles will appear out of which ever one they want. Above each hole there is a hammer and above the hammers are the numbers 1-9.

Once a mole appears, you have a couple of seconds in which to hit the button on the key pad that corresponds with the number above that hole.

Scoring

Scoring is as follows:

10 points for each one of the first 60 moles hit.

20 points for each of the final 20 moles hit.

- 5 points for each wrong key pressed on the first 60 moles.
 - 10 points for each wrong key pressed on

the final 20 moles

To change the speed of the game, you may change the pause in line 325.

Program notes

Line function

20-140	Setting up variables
150-260	Setting up screen display
265-360	Main game
370-390	Checks if you have hit a mole or not
500-570	Hitting mole routine
600-620	Printing score at the end of a game
631-637	Determines whether you deserve a replay or not
640-700	"Do you wish to play again?" routine DO NOT ALTER ANY OF THE FIRST 6 LINES.

```

1 LET HS=0
2 POKE 16418,0
3 PRINT AT 22,0; "
4 PEEK 16551
5 PEEK 16551+65,183
6 PRINT AT 11,18;"READY ?"
7 LET L=RND$*INT(RND*10)**RN
D+23+RND-D*RND
8 PRINT AT 11,18;""
9 LET R=60
10 DIM A(3)
11 LET A(1)=5
12 LET A(2)=13
13 LET A(3)=21
14 DIM B(3)
15 FOR F=1 TO 3
16 LET B(F)=A(F)-3
17 NEXT F
18 DIM C(3)
19 LET C(1)=5
20 LET C(2)=15
21 LET C(3)=25
22 FOR F=1 TO 3
23 PRINT AT R(F),C(N);"
24 PRINT AT B(F),C(N);"
25 NEXT N
26 NEXT F
27 PRINT AT B(1)-3,0;"      1
28           3"                   4
29 PRINT AT B(2)-3,0;"      4
30           5"                   7
31 PRINT AT B(3)-3,0;"      7
32           8"                   9
33 FOR T=1 TO 10
34 LET F=INT((RND*4)
35 LET N=INT((RND*4))
36 IF F=0 OR N=0 THEN GOTO 270
37 PRINT AT R(F)-1,C(N);"
38 PRINT AT 0,0;"YOUR SCORE "
39 "HIGH SCORE ",HS
40 PAUSE 40
41 LET A$=INKEY$
42 IF A$<>"" THEN GOSUB 370
43 PRINT AT R(F)-1,C(N);"
44 NEXT T
45 IF A$<>"" THEN GOSUB 370
46 PRINT AT R(F)-1,C(N);"
47 NEXT T

```

```

370 GOTO 500
370 IF (A$="#1" AND (F=1 AND N=1))
    ) OR (A$="#2" AND (F=1 AND N=2)) ) OR (A$="#3" AND (F=1 AND N=3)) ) OR (A$="#4" AND (F=2 AND N=1)) ) THE
R N GOTO 500
380 IF (A$="#5" AND (F=2 AND N=2))
    ) OR (A$="#6" AND (F=2 AND N=3)) ) OR (A$="#7" AND (F=3 AND N=1)) ) OR
(A$="#8" AND (F=3 AND N=2)) ) OR (A$="#9" AND (F=3 AND N=3)) THEN
GOTO 500
390 IF S>0 THEN LET S=S-5
400 RETURN
500 PRINT AT B(F).C(N); "
510 PRINT AT B(F)+2,C(N); "
520 PRINT AT B(F)+4,C(N); "
530 LET L=RND*#10+RND*#10+RND
540 PRINT AT B(F).C(N); "
550 PRINT AT B(F)+1,C(N); "
560 LET S=S+10
570 RETURN
580 FOR T=0 TO 10
590 PRINT AT 11,10;"YOU SCORED
":S;AT 12,5;("THAT'S A NEW HIGH
SCORE" AND S;HS)
615 IF S>HS THEN LET HS=S
620 NEXT T
630 CLS
631 IF S<900 THEN GOTO 640
632 FOR T=1 TO 10
633 PRINT AT 11,6;"YOU NOW HAVE
REPLAY"
634 PRINT AT 11,21;"REPLAY"
635 NEXT T
636 CLS
637 GOTO 265
640 PRINT AT 11,5;"ANOTHER GO ?"
(Y/N)"
650 IF INKEY$="" THEN GOTO 650
660 IF INKEY$="N" THEN NEU
670 IF INKEY$="Y" THEN GOTO 690
680 GOTO 650
690 PRINT AT 11,5;""
700 GOTO 3

```

DO NOT ALTER ANY OF THE FIRST 6 LINES

Screen movement

on Vic20

This is a program for the unexpanded Vic and was found by mistake. I was typing in

a program and instead of typing 36879 for colour I typed 36897 and found that the screen of my Vic moved. So I poked around and wrote this program.

Program notes

10-50	Rems
60-110	Controls for the program
120	Normal co-ordinates for screen
130-170	Input and decode movements
180-190	Move screen routine
200-240	End and restore screen to normal

```
10 REM %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
20 REM %% SCREEN MOVEMENT %%
30 REM %% BY %%
40 REM %% SEAN MARSH %%
50 REM %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
60 PRINT "PRESS: "
70 PRINT "U=UP"
80 PRINT "D=DOWN"
90 PRINT "L=LEFT"
100 PRINT "R=RIGHT"
110 PRINT "*=STOP"
120 U%=38:L%=12
130 GET A$: IF A$="" THEN 130
```

```

140 IF A$="U" THEN U%=U%-1
150 IF A$="D" THEN U%=U%+1
160 IF A$="L" THEN L%=L%-1
170 IF A$="R" THEN L%=L%+1
180 POKE 36897,U%
190 POKE 36864,L%
200 IF A$="*" THEN 220
210 GOTO 130
220 POKE 36897,38:POKE36864,12
230 PRINT "          O.K.  BYE"
240 END

```

Screen Movement *by Sean Marsh*

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OPEN FORUM

Tape Space

on Spectrum

The function of this routine is to find the first empty space on a cassette and automatically *Save* data or an array at that point. It is intended for the Spectrum, 16K or 48K versions.

This routine is suitable for adding to any program which permits the *Saving* of data, and greatly facilitates the construction of a data tape. I have not found the alternatives, such as *Loading* the last item on the tape then using *New* prior to *Loading* the main program, or counting the items while running through the tape, very satisfactory. This routine automates the whole process.

As an example, I have made the enclosed sample routine suitable for adding to the Horizon character program which is supplied with the Spectrum. It can be added either to the original program, or to the program plus the mirror graphics routine featured in PCW 12-18 May. Although I have not tried it with a 16K version, I foresee no difficulty in it fitting.

Alterations to the Horizon program have been made in order to fit the addition into the space available. Lines 7065 and 7066

have been joined together, and a new 7066 added. The former line 7070 has been made 7080. 9010 has been changed so as to place the new machine code in front of the existing code. 9100 is changed so as to put *Ramtop* before the new machine code. All these changes appear on the printout.

The operation of the routine is fully explained within the program. Some points of interest follow. The user enters the file name of the last file already on the tape. The routine reads all the headers and matches them with the name which was entered. When it finds a match, it makes the value of address 23320, 100 and line 7072 causes a jump to the *Save* routine starting at 7076. The *Pause* at line 7076 causes the routine to wait until the cassette recorder has reached the end of the file.

In the absence of accurate information as to the number of bytes per second delivered by the tape, I came upon the parameter of *Pause* by trial and error. The time needed is one second for the space between the header and the program, three seconds for the leader of the program, one second or so for a suitable gap before *Save* starts, and the actual length of the program.

Given an accurate value for the baud

rate, it will be possible to compute an exact figure from the program length which is to be found at *Peek* 23307 $\text{t}256 * \text{Peek}$ 23308.

If the routine is to be adapted for another program, instead of *Gosub* 6200 substitute *Cls*. The line numbers should, of course, be changed as required by the new program. Line 7080 must of course be adapted for the particular data or array it is wished to *Save*.

The machine code routine can be located in any suitable position, and the location chosen will, of course, dictate the values used in lines 9010 and 9100. The machine code can be entered and *Saved* as in this example, or it can be included in a *Data* statement within the main program. (This would not be suitable in the Horizon program since it already uses a *Data* statement which could cause complications.)

To enter the routine as listed, first enter as a direct command *Clear* 32221 and *Enter*, then enter the routine at section 4 of the printout, and enter the numbers in section 2. Then enter the additions and alterations as in section 1, remember to remove the loading routine from lines 10 to 45, type *Goto* 9000 and the rest is automatic.

Section 1

```

7065 GO SUB 6200: PRINT "Enter t
he file name of the code to be s
aved": INPUT LINE f$#
7066 DIM l$(1,10): PRINT "Enter"
name,"of last file on tape";"
("ENTER" if tape is blank)": I
INPUT LINE l$(1)
7067 IF l$(1,1)=" " THEN GO TO 7
038
7068 FOR f=23309 TO 23318: POKE
f, CODE l$(1,f-23308): NEXT f
7069 GO SUB 6200: PRINT "Select
""Playback"" and run tape from
start": POKE 23320,0
7070 RANDOMIZE USR 32222
7072 IF PEEK 23320<>0 THEN GO TO
7076
7074 GO TO 7069
7076 PAUSE 250
7077 GO SUB 6200
7078 PRINT FLASH 1;"STOP TAPE" /
FLASH 0;"SELECT ""RECORD"""
7080 SAVE f$CODE b,l
7081 SAVE "CODE 32222,334: STO
P
9100 CLEAR 32221: LOAD ""CODE

```

Section 2

55	62	0	221	33	0	91	17
13	0	205	86	5	6	10	33
13	91	17	1	91	26	190	192
19	35	16	249	33	24	91	54
100	201						

Section 3

7DDE	37	SCF
7DDF	3E 00	LD A, 00
7DE1	DD 21 00 5B	LD IX, 5B00
7DE5	11 0D 00	LD DE, 000D
7DEB	CD 56 05	CALL 0556
7DEB	06 0A	LD B, 0A
7DED	21 0D 5B	LD HL, 5B0D
7DF0	11 01 5B	LD DE, 5B01
7DF3	1A	LD A, (DE)
7DF4	5E	CP (HL)
7DF5	C0	RET NZ
7DF6	13	INC DE
7DF7	23	INC HL
7DF8	10 F9	DJNZ 7DF3
7DFA	21 18 5B	LD HL, 5B18
7DFD	36 64	LD (HL), 64
7DFF	C9	RET

Section 4

```

10 FOR f=32222 TO 32255
20 INPUT i
30 POKE f,i
40 PRINT PEEK f:NEXT f

```

45 STOP

Tape Space
by Michael Kirkland

DRAGON SOFTWARE

all machine code

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Tony Bridge's Adventure Corner



Castles of . . .

Along the rain-lashed forest road comes the black coach. The four terrified horses are whipped by a black-caped coachman, and the whites of their eyes shine in the fitful moonlight.

The coach rounds a bend and, by the shocking glare of a flash of lightning the haunted hulk of a dark castle is glimpsed on a tree-shrouded hill in the distance. (*Oh get on with it, Bridge! Ed.*)

Sorry about that! For some reason, we've had a lot of "Castle of . . ." adventures lately, so I thought we'd compare them. They're all for the Spectrum, and the first one out of the bag is: *Castle of Death* (from Electra Software, and for the expanded Spectrum). This one loads in two parts, so the screen must be watched intently. B Stangroom, the author, has written a scenario which concerns your struggle to negotiate the maze-like grounds of the eponymous edifice.

After the instructions, you are invited to hit *Enter* — but don't take this literally, you would do better to press *Enter!* The program then tells you that, unlike many other adventures, "the idear (sic, I'm afraid!) of this game is not to work out how to phrase your command." The commands are then listed for you, but you'd better write them down as they are not repeated.

You start on a dirty path, with exits North and West. There are no objects here, so press (or *Hit!*) N, to go North, and the computer goes to sleep until you press another key. Thus every move takes at least two key depressions.

As in most adventures, you should make a map of your wanderings — there are several objects lying around, always, it seems, in the same position. However, at any moment you may slip and smash your skull, which proves fatal. This seems purely random, which is a little unfair.

I haven't, so far, managed to get to the castle. But, though things may hot up a bit inside, I'm afraid that the mechanics of the game, along with the sheer randomness of fatal accidents did nothing to endear me to the *Castle of Death*.

Down the road a few miles we come to the *Castle of Doom*. The architects of this delightful little residence are Specsoft. The program comes on a tape with a bonus of an arcade game, *Missile Command*. The

cassette box contains a blurb which prattles on about the program being "a winner in the adventure game field. Highly original and amusing." Well, Specsoft are at least one-third correct — the game is occasionally amusing.

The program is loaded in four parts, each section presenting you with a different scenario. The first stage is the countryside, with farmyard scenes playing a major part. The second stage takes you into the town, while the third part of the program takes place in the mountains.

Each scenario requires you to wander about, picking up various objects as you find them, and using them wisely in order to get past the obstacles that you meet.

The fourth part follows the same pattern, but takes place in the castle.

I found the map-making enjoyable, but ultimately the game paled — not least because there is no point to the proceedings. After many happy hours of wandering around, I was finally asked to give the correct answer to a weedy riddle. *Peeking* at the listing took care of that!

On without pause for breath to *Magic Castle*, from Gilsoft, "for any 48K Spectrum". This time it is a Princess who is imprisoned in the castle, and it's your job to rescue her. Again the instructions are all in the program, but unfortunately the only way to get back to these once you've started playing is by *Quitting*.

Like the others in this survey, *Magic*

Castle is a text adventure. This follows the traditional adventure rather closely, with the obligatory maze near the start (represented by a minefield and an impenetrable forest), a torch that has to be lit, and all the other paraphernalia. I liked this one, even though the keys didn't respond very quickly to being "Hit".

Not much room left this week, just enough to reply to letters I've had from some of you regarding *The Valley* (you may have seen, in the past couple of weeks, the news stories about discussions between Kayde and ASP concerning this program.) Henry Budgett, of ASP, kindly let me have a copy of his "*Valley*", and I hope to have a report on it soon.

Finally, if any of you are currently playing *The Knight's Quest*, from Phipps Associates, remember: *The microdrive is not, repeat not, the object of this Knight's quest!*

This series of articles is designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So, if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to: Tony Bridge, Adventure Corner, Popular Computing Weekly, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Cruising & Blind Alley

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Cruising

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Popular Computing Weekly is offering £10 each month to the player with the highest score on *Cruising*. All you have to do to enter this month's competition is send a print-out of your highest score, together with your name and address, to:

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Each month we will publish the name of the winner and the new *Cruising* high score. Are you good enough to accept the *Cruising* challenge?

The winner of last month's competition with a score of 27673 was C. Moore of Patchway, Bristol, who receives £10. Entries for this month's competition close on July 31.

Notes

- 1) Each entry must consist of a ZX printout and your name and address.

2) Closing date for this month's *Cruising* challenge entries is July 31.

3) The highest score each month will receive £10.

4) High scores cannot be transferred from one month to another.

5) The judges' decision is final.

6) No employees of Sunshine Publications Ltd. or their families, will be eligible to enter.

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The winner of last month's competition with a score of 70625 was Stuart Williamson of Bradford, West Yorks. Entries for this month's competition close on July 31.



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ZX81 LISTINGS

Kevin Palmer of Hamble Court, Bodycoats Road, Chandlers Ford, Hants, writes:

Q I am writing to ask if it is possible to give me some information or listings that would help me become accustomed to machine code on my ZX81. It is unexpanded, but I have access to a 16K Ram pack. Also, I would be very interested to know where the nearest ZX club is to me.

A We do not have any specific listings to help you, though you will undoubtedly glean some information from working through any of the machine code listings published in *Popular Computing Weekly*.

Perhaps your best bet would be to purchase one of the many books on machine code. Two books that can be recommended are *Machine Code and better Basic* by Ian Stewart and Robin Jones (Shiva — £7.50) and *Mastering Machine Code on your ZX81* by Toni Baker (Interface — £7.50).

As to your nearest ZX club, according to my map you are halfway between Winchester and Southampton. Unfortunately, I could not find any clubs in that region. I can only suggest that you try a trip to your local library — if they do not know of any clubs, they might be willing to help you start one.

BASIC NONSENSE!

D Moore of Abridge Close, Redcar, Cleveland, writes:

Q I was recently looking through *Popular Computing Weekly* for 14-21 April

and I noticed a line 0 in the Defender program. I tried to put this into my Spectrum, but all I got was the report code 'C Nonsense in Basic'. Is there anyway that I can Poke in a line 0?

A The procedure for this is the same with both the ZX81 and the Spectrum — it involves Poking the systems variable *Prog*. All you need to do is look up the address and Poke it with nought. You then Poke the address plus one. So it is:

POKE 23635,0
POKE 23635 + 1,0

QUALITY CASSETTES

David Brown of Trewillard, nr Penzance, Cornwall, writes:

Q I wonder if you could tell me if computer quality cassettes are better than normal ones. Also, is Binatone bringing out a £50 computer that has colour and sound. They wrote a letter to my school about it months ago, and it is now well past launching date.

A Computer quality cassettes are better because they are shorter, and should have a better magnetic coating. One thing that causes problems when using a cassette is that, the longer the tape, the more work the motor has to do to keep the tape running evenly. This, in turn, makes it more likely that a fluctuation will cause a crash.

Thank you for your note about Binatone writing to schools, it is something that I did not know about. In all honesty, with new computers coming on to the market all the time, the Binatone has had a remarkable track record of engendering interest, without any sign of the product actually coming into the market place.

CRASHING PROBLEM

Martin Richards of The Green, Urchfont, nr Devizes, writes:

Q I have a most tormenting problem. When I input Poke 65495,0 or some other sort of Poke, the computer crashes completely. So, I press the Reset button, but even then if I put in just Enter it

comes up with ?SN Error.

It is most frustrating, as I cannot speed up my games, and all the programs in magazines seem to contain this Poke. I still have my guarantee. Is it worth giving up or renewing? I forgot to mention, my computer is a Dragon.

A This problem arises from the fact that different batches of the Motorola chip seem to have been made to different standards. It must be said that all the Motorola chips used in the Dragon do meet the published specification. Some of them exceed it. This Poke can only be used on those chips which exceed that specification, since it has the effect of doubling the speed of the chip, which it was not designed for.

As far as I know, there is no way of telling from the outside what sort of chip you have inside, other than the fact that it will meet the basic specification. Neither is there, to my knowledge, a list of which addresses cause problems if Poked in this way. What must be said, is that you seem to say from your letter, that every Poke gives this effect, when in fact it should only happen on relatively few addresses. If your system crashes on any address you Poke, then there is probably a fault, and it should be returned under the guarantee.

WHAT IS FORTH-79?

David Tattnall of Bournemouth Avenue, Euston, writes:

Q I am thinking of trying to learn another computer language than Basic, namely Forth. However, I know very little about it, though I am waiting for a couple of books to come through the library.

One thing I would like to know, for a start, is what is Forth-79? Is it the language as designed in 1979? And is Fig Forth the same? Also, which does the Jupiter Ace use, if the

two are different, and is RPN Reverse Polish Notation?

A Forth was developed by Charles Moore in the late 60s, and early 70s. This lead to the setting up of the Forth Interest Group (FIG) who developed a standard version of the language. However, this was one of several, so a Forth standards team was formed — in 1980 they came up with Forth-79. There is still a lot of argument between the two, as to which is best.

The Ace uses a modified form of Forth-79 — again, there are arguments as to which is better. If you are new to Forth, and you start with the Ace, there should be no problems, until you try and use another standard. If you are used to Forth-79, you might find some of the omissions on the Ace annoying, on the other hand some of the extras can turn out to be very useful.

RPN is Reverse Polish Notation, as used in all the implications of Forth.

SPECTRUM UP-GRADE

R H Crawshaw of Aasket Drive, Leeds, writes:

Q Can you give me some information on the upgrade kit for the 16K Spectrum as offered by Fox Electronics. I would particularly like to know:

- Would my guarantee from Sinclair be invalidated?
- Would the kit make my Spectrum fully equivalent to a normal 48K Spectrum?
- Is it possible for a complete amateur to fit the kit?

A Yes, to all three queries. If you use non-Sinclair upgrade, then your guarantee will be invalidated. The kit does give your Spectrum 48K.

Fox will also send you advice on tuning your Spectrum to your television. All you have to do with the upgrade is put the chips into the sockets — details of which chips go where are provided.

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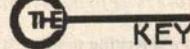
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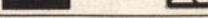
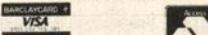
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48K SPECTRUM + over £200 of games, utilities, adventures and books. Quick sale, hence best offer over £130 accepted. Tel: 0908 75094.

SPECTRUM 8K EXPANSION. perfect condition, leads, manual, three games and Spectrum book, £120 ono. Tel: Blackpool 42923.

48K SPECTRUM + printer + 15 rolls of paper + £90 software + £22 machine code books. Worth at new price £285. Sell for £175. Tel: 6993232 before 7 pm.

48K SPECTRUM issue 2 fuller keyboard, fuller amp, cassette recorder, magazines, some software, printer to be included, £250 ono. Tel: 521-0672.

ZX SPECTRUM 48K + software, books, joystick, magazines, £200 ono. Tel: 01-840 2738 after 7 pm.

48K SPECTRUM + printer + 10 rolls + software and books, £160. Tel: South Benfleet 3909.

ZX81s for sale

ZX81 16K Zonix 81 sound pack, 10 tapes, 20 magazines, two books, £75. Tel: Crawford 524859.

ZX81, 16+ plus printer plus paper and manual plus books. £70. Tel: Nutley 236925 after 6 pm.

ZX81 plus all leads, some tapes, manual, book, boxed. £35. Tel: Eccles 453247.

ZX81 + 16+ + £20 worth of software, sell for £50. Tel: Sheffield 699847.

ZX81 16K GAMES, two books and magazines. Tel: Carol on Idminton 610466, £70 ono.

16K ZX81, 4K graphics, Rom 1K, user to find graphic chip, £75 of software and magazines, £80 ono. Tel: 660 6807.

ZX81, 16K plus file, 60 keyboard, still under guarantee plus loads software, as new. Tel: (Bristol) 676194.

ZX81 with high res graphics, 16KRP + VDU, £70. Tel: 01-850 1445.

ZX81, 12 months old, with new 16KRP and power supply unit, over £30 software, magazines for £45 ono. Tel: Sid on 061-633 6887.

ZX81, 16KRP, books, magazines and games, £55 ono. Tel: Medway 252177. **ZX81**, with five months guarantee to run 16KRP (eight months guarantee) plus £70 popular software including all manuals and leads, £90. H. Withcombe, 35 Northview Avenue, Bideford, North Devon.

ZX81, 16K, very good condition, keyboard, books, magazines and programs plus tape recorder (optional). Offers please. Tel: Radlett 4322.

ZX81, 16K plus books plus 45 tapes, £150 ono. Tel: Offton, Suffolk 461 between 6 and 7 pm.

ZX81, 16K, Kempston keyboard, Zonix sound unit, Spectrum extension board, £20 software, manual, leads, etc. £90 ono. Tel: 01-660 6007.

ZX81, 16K, manual, leads, power pack, £45. Tel: Hornchurch 57298.

ZX81 plus 16K plus reliable tape recorder, software worth £100 plus magazines and books, bargain at £63. Tel: Chelmsford 441948.

ZX81 + 16K + leads and manual + book. Sell for £50. Tel: 01-274 9010, 5 pm to 9 pm.

ZX81 16K + £130 worth of software. Sell for £95 ono. Tel: 021-449 0684 (evenings and weekends).

16K ZX81, fitted with DK'Tronics graphics Rom board, sound pack, lots of software, £40 of magazines and books. All fitted in a console + black and white TV with aerial (14 inch). Sell for £200. Tel: 01-998 8117.

ZX81 + 16K, original box 22 cassettes, games, adventures, education software, three books, leads, manual. Tel: 01-883 0122 after 4 pm, £70.

MEMOTECH 64K memory pack. Little used. Tel: 040. Tel 0955 3428 evenings.

16 ZX81 + PSU, leads and manuals, two tapes. Sell for £40. Tel: 01-882 2288 after 5 pm.

Ataris for sale

COLOUR GENIE, five months old, £175. Tel: Durham 46807.

TREXAS TI994A, £100, no offers. Tel: 01-837 3300, extension 2275.

SHARP MZ 80K, 48K memory, six languages, word processor, 100 program library and machine code games, £350. Tel: Tewkesbury 297579.

NASCOM 36K, NAS SYS/T4 monitors, including video monitor/hi-speed cassette interface, recorder, software and documentation. £120 ono. Tel: Huddersfield (0404) 25181 evenings.

48K ORIC 1. New. Unopened. Sale £125 cash. Tel: Croydon 654-7471.

ATARI 400 32K, 2790, Atari 410 program recorder 238, basic cartridge + two manuals £35, joystick £4 plus software. Whole lot £300. Tel: Cowes 297205.

ATARI 400, 16K, tape deck, basic, assembler, joystick, games, manuals, £200 ono. Letchworth 70331 after 6 pm.

ATARI VCS + software, mint condition, boxed, as new, £65 quick sale. Tel: 01-348 5668.

ATARI 400, 48K, tape deck, basic, books, joystick, £175 ono. Tel: Edendale (0732) 863815 after 6 pm.

ATARI VCS + two cartridges, £65 ono. Tel: 061-6524628.

SWAP brand new Atari 800 16K Ram memory, expansion module, cost £65, for Mattel Intellivision cartridges. Tel: 0726 63501 (after 5 pm).

ATARI 800 16K, 2 joysticks, chess cassette, Pacman, Centipede, Star Raiders, books, £400. Tel: 01-736 3889, Mr Robinson after 6 pm.

ATARI 400 48K, disc drive, cassette recorder, joystick, Basic and manuals, plus software, £425 ono or sell separately. Tel: 01-301 3289.

ATARI VIDEO GAME SYSTEM + 3 cassettes, one year old, £60. Tel: Northern Ireland, White Abbey, 52030.

ATARI 400 16K including Basic cartridge tape recorder including various cartridges and 2 joysticks + all Basic manuals, £200. Tel: 01-435 7336.

Dragons for sale

DRAGON, joystick, games, worth £300, £165 one or swap 48K Spectrum plus cash or games. Tel: Trowbridge 3965.

DRAGON 32, 1 month old, 2 years guarantee + joystick, software, books, worth £240, yours £180 ono. Tel: Harlow (0279) 30665 after 6 pm.

DRAGON 32, £50 of software, cassette recorder, all leads, offers. Tel: 043-871 4390 (evenings).

DRAGON 32, 6 months old, excellent condition + £30 games software, £150 ono. Tel: Stanford-le-Hope 624635.

DRAGON 32, very good condition, 3 months old, guarantee and joystick, £160 ono. Tel: 01-993 5502.

Acorns for sale

BBC SOFTWARE to sell or swap. Tel: 01-808 8906 (after 6 pm).

BBC B, 1.2 OS, wordwise, joystick, £100 of software, £450 ono. Tel: 01-267 2430.

ACORN ATOM COLOUR, 24K Rom + 12K Ram with 30 software cassettes, power supply cassette recorder, 9in monitor, £180 ono. Tel: 01-487 5411 ext 54 (day), 01-229 0495 (evening).

DISC CONTROLLER CHIP (No. 8271) for BBC micro, £20 ono. Tel: Basingstoke 54426.

BBC JOYSTICK interface, compatible with Atari and Vic joysticks, £8.50 or £10 for two sockets, also on offer software for sale or swap. All types of software. Tel: 01-571 2870.

Commodores for sale

CBM DUAL DISC DRIVE for Basic 4, good condition, some software on disc, £325. Washington 091 4170754.

BRAND NEW Vic/Commodore 64, disk drive, it costs £300 but its yours for £249. Tel: Harpenden 69152 (after 6 pm) for details.

BRAND NEW VIC/Commodore 64 Printer, it costs £230, but you can have it for £195. Tel: Harpenden 69152 (after 6 pm) for details.

BRAND NEW Commodore 64 with joystick, cost £350+, but it's all yours for only £295. Tel: Harpenden 69152 (after 6 pm) for details.

VIC20 + CZN cassette, as new, no manual, £10.50 ono. Tel: 01-253 8282 (Miss Mason).

COMMODORE VIC20, 8K, tape deck, joystick, games + books, £120. Tel: 01-560 1892.

VIC20 + cassette + 16K Ram pack + joystick + Programmers Reference Guide + three cartridge games including Voodoo Castle, over £60 of other software, has still got 18 months guarantee. Cost £500, quick sale £250. Tel: 515 4696.

COMMODORE METEOR SPACE GAME, excellent value at just £1.50. D. Spencer, 230 Lowgrange Avenue, Billingham, Cleveland.

VIC20, unexpanded, games etc, 25 + cassettes at only 99p each, send £1 for list and game. D. Spencer, 230 Lowgrange Avenue, Billingham, Cleveland.

BBC MODEL B, 1.2 operating system, very good condition, includes £800 software, £545 ono. Tel: 0849517.

VIC20 + cassette unit, 8K Ram pack, 3K Ram pack, motherboard, 3 cartridges including Golf, joystick + 12 cassettes, magazines, books + television, £300. Tel: 061-4271605.

VIC20, program reference guide, £5 + Vic Revealed, £7, or £10 both. Tel: 01-574 4122.

VIC20 + cassette unit + dust cover and books, £95. Tel: 051-4878442.

VIC20 + cassette + 16K Ram. Introduction to Basic + 2 books, Sargon 2 + adventure cartridge, Vicmen and many games + magazines, £180. Tel: 01-205 2834.

VIC20, CZN, 16K + 3K, dust cover, joystick, adventure cartridge, over £100 software, books, cost £450, need £299 ono. Tel: Alton 2477 after 5 pm.

VIC20 plus Commodore 16K Ram pack, cassette deck, joystick, Vic Revealed, dust cover, nine cartridges and 30 cassettes (original). Cost £600, for sale £220. Tel: (Southend) 0702 201637.

VIC20, Mission Impossible swap for Omega Race or Rat Race. Tel: 01-656 7441 (evenings).

VIC20, cassette unit, 16K, £30 of software, £180. Tel: 061-4409828.

VIC20, 19K, Stack storeboard, 4 slot motherboard, cassette unit, lots of software, books, joysticks, £150 for quick sale. Also Sargon 2, Chess + Spiders of Mars cartridges, £14 each. Tel: 01-788 8272.

VIC20, + cassette deck + lots of software, books, joysticks, £150 for quick sale. Also Sargon 2, Chess + Spiders of Mars cartridges, £14 each. Tel: 01-866 6321.

FOR VIC20, Stack 40:80 column card, £50; Stack Vic kit 1 and 3 + 3K Ram, £30; for sale (all one month old), also Vic games, £4. Tel: 051-430 0905.

12-INCH MONITOR, satin finish case, good condition, £45. Tel: 01-207 5840. **VIC20 + cassette**, immaculate condition, 18 months warranty, £150 ono. Tel: 515 4696.

VIC20, C2N cassette, 8K, expansion cartridge joystick, Sargon Chess cartridge, intro to Basic part 1, books + magazines, £150. Tel: Coventry 614104.

VIC20, CN2 cassette deck, joystick + 7 cartridge games, £200. Tel: Harlow 417 618.

VIC20, Myriad, The Alien, Moons of Jupiter, all +3K, Vicmen, Catcha Snatcha, Ski-run, Wacky Walkers, Pit Amock, 3K Rampack. Best offers Tim, Tel: 0825 4524.

VIC 1515 PRINTER, £200 ono. Tel: Roger Cheddell, 02514 23499 (after 6 pm).

SWAP VIC20, quality software, e.g. Nightcrawler, especially for Rabbit, Lamsoft, software also wanted: Solutions for Voodoo Castle on Vic 20 will pay £1, will sell solutions for Adventureland. Tel: 051-327 2135.

COMMODORE PET 3008, upgraded to 16K, 40 x 25 screen complete with cassette deck, manuals + cover, £200 ono. Tel: (Luton) 0582 54155 (office hours only).

COMMODORE 64, + cassette + software, magazines, £300. Tel: 01-251 3769 (after 5.30 pm).

VIC20, 3K, memory expansion, 10 software games, computer + tape recorder, £135 ono. Tel: 021 3567973 (after 6 pm, ask for Simon).

VIC20 + cassette, also super expander, 5 games cartridges + more than £70 of software, joystick, introduction to Basic 1, 4 books and some magazines, only £235 ono. Tel: Great Harwood 0254 885333.

VIC20 cartridges for sale, open to offers. Tel: 0442-58200.

VIC20, cassette deck + 16K expander, introduction to Basic parts 1 and 2 + software, £190. Tel: Sheffield 621515.

VIC20, software for sale, cartridges, including Sargon 2 Chess, £15; + Star battle, Alias Road Race, £11 each. Tel: 01-574 4122.

VIC20 GAMES, Mission Impossible, Sargon Chess, Slot, Road Racer, Master Mind, £50 the lot. Tel: Taunton 88726.

VIC20, + tape unit + 16K switchable Ram + 3 Vic computing magazines + 4 software cassettes worth £30, £155 ono. Tel: 021-429 9617.

VIC20 8K RAM PACK for sale, £25 or swap, part exchange for 16K Ram. Tel: Johnstone 21027.

VIC20 + 24K extra Ram, Arfon expansion unit, C2M cassette unit, Vic disk drive, Vic printer, £320. Tel: 0344 886178 any time.

VIC20, still under guarantee, plus cassette recorder, cassettes, one games cartridge + eight other games on cassette + programming aids and joystick. £150 ono. Tel: 062082 2556.

COMMODORE 64, brand new, still boxed, £280. Tel: 0344 886178.

VIC 20 + Vic 1540 disc drive + cartridge, £300 ono. Tel: Exeter 3340 (Otter St Mary).

VIC20 (unexpanded) + books, £75 ono. Tel: 0302 840768.

COMMODORE 32K 8032. Disc drive 8080 + toolkit and cable connection, some programs if required. Business machine. Can be updated. £1,000 the lot complete. Tel: 01-311 6511.

VIC20 unexpanded, £70 ono. Tel: Bristol 421962.

COMMODORE 64 + much software, one month old, still 11 months guarantee left, £290. Tel: 01-656 0511.

COMMODORE 64, still under guarantee, £280. Tel: Preston 615397.

VIC20 Programs and Part 1, various cassettes, eg. Froggers and Skramble, two cartridges including Slot Machine and Jelly Monsters, one joystick, one book of 50 games, £15.00. Tel: Evesham (Worcestershire) 45098 after 6 pm.

SWAP VIC20 Commodore 16 Ram pack for £45 worth of Dragon 32 software or sell for £45, originally cost £80. Tel: 01-303 2952 after 5 pm, ask for Andrew.

COMMODORE 64 as new, £280 ono, 1541 disc drive, latest model, £250 ono. If sold together over £100 software free. Delivery can be arranged. Tel: Burntwood 05436 72592.

VIC15/15 PRINTER + Vic winter program, £150. Tel: 01-959 7031.

VIC20 + cassette deck, 16K, 8K and Supercard, joysticks, £550 cassette and cartridge software, £350 ono. Tel: Medway 365452.

COMMODORE 64 + latest C2N data cassette unit + reference manual (500 pages) + £100-worth of software. Guarantee for nine months. Boxed, £370. Tel: 01-450 4858.

VIC20 C2N CASSETTE DECK, software, Whacky Races, Blitz and Frogger, all boxed. Perfect condition, £120. Tel: 061-941 2553.

32K PET large keyboard, external cassette, green screen, revision and Rom, many cassettes, disk-o-pro chip. Quick sale, £350 ono. Tel: 01-398 6963.

FROGGER for 16K Spectrum, £3.50. Tel: Merston 2824.

VIC20 + C2N cassette deck, boxed, as new, urgent sale, £110 ono. Can deliver London. Tel: 01-485 7121 (Tony Marsh).

VIC20 + cassette unit, 16K and 3K Ram packs, Adventure cartridge, dust cover, joystick, £100 software, many books, all boxed, cost over £450, want £299 ono. Tel: Abson 2477 after 5 pm.

COMMODORE PET 3032, large keyboard, tool kit, super chip, manuals, £275 ono. 3022 printer, dustcover, manuals, £165 ono. Tel: 01-979 9628

VIC20, 30%K, 4 slot mother board/light pen, joystick, tool kit, hi-res graphics, £100 + software, Programmers Aid, Introduction to Basic, Part I, £400 ono. Tel: High Wycombe 30483.

SWAP VIC20, keyboard and cassette unit and small selection of games on cassette + joystick for ZX Spectrum. Tel: Medway (0634) 575102.

VIC20 plus data cassette recorder, £170. Tel: Grays Thurrock (Essex) 70623 after 6 pm.

FOR YOUR VIC20, stack super charger including Vic kit 1 and 3 + 3K of Ram, £30. 40-80 column card £45, selection of games £3 each. Tel: 051-4300905.

VIC20, with C2N cassette deck and 3K, 8K and 16K Ram Pack, with programmers aid and machine code monitor + joystick and paddle, with four cartridge games, £130 cassette software introductory to basic Part 1 and 2 with Vic revealed and programmers reference guide, worth £665, sell for £300, still under guarantee. Tel: 01-892 8768.

BBC MODEL B + 1.2 OS + disc interface, plus tons and tons of software, £550. Tel: 01-574 4122.

VIC20 + cassette, printer, joystick, RS 232, super expander, Getting Acquainted with Vic20, carry case, printer paper, lots of games and mags, £420 ono. Tel: Weston-super-Mare 813056.

VIC 1213 machine language monitor cartridge, £20 ono (recent let down sale), 49 Beech Avenue, Brentford, Middlesex.

VIC20 still under guarantee plus CZN cassette unit, 13 tapes, Introduction to Basic, Part 1, plus joystick, boxed as new, £150. Tel: Thetford 5665.

ACOUSTIC MODERN 8010, as new, £70 ono. Tel: 0403 731650 after 6 pm

For sale

COLONEL'S HOUSE CASSETTE for Vic20 for £7 or swap for another adventure. Tel: 021-472 4534 after 4 pm.

48K APPLE II, £425 ono. Tel: Bookham 53974 after 7 pm.

GENIE I (16K), integral cassette + EG 101 12in screen phosphor monitor, under guarantee. Any reasonable offer. Tel: Roberts Bournemouth (02027) 292719.

ATARI VCS CARTRIDGES: Dragster £6, Outlaw, Basketball, Surround, Space War, Blackjack, £8 each; Bowling, Street Racer, Video Olympics, Circus, Maze Craze, £10 each. Tel: 01-669 7590 after 6 pm.

TI 994A as new plus joysticks, tape, lead and Grammar for Beginners cartridge, £100. 01-515 7962 after 2 pm.

TI 994/A, 6 months old including cassette leads and cassette player, also TI Invaders and Munchman, Command modules, various cassettes, £125 ono. Tel: 024 863230 anytime.

LYNX 48K COMPUTER FOR SALE, brand new with all leads, 2 software cassettes, must sell, emigrating, only £199. Tel: Saffron Walden (0799) 22207, Steve after 6 pm.

ZX PRINTER, 8 months old + 4 rolls of paper + 3 ZX Forth, £37.50. Tel: 061-4347026.

BASIC TELEVISION CONSOLE in need of attention, £10. Tel: Chelmsford 50092.

SHARP MZ 80K, 48K Ram, integral monitor and cassette recorder, perfect condition, £200 of software, J. White. Tel: 06268 4377, ext 4307, 9 am to 5 pm only.

LYNX 48K, 3 months old, £190 ono. Tel: Huntingdon 0480 215557 (evenings).

LYNX 48K, with cassette recorder plus three tapes, £210. Tel: Swansea (0792) 891578.

JUPITER ACE, as new, with user magazines, bought for £90, quick sale for £60. Tel: Farnborough, Kent, 57482.

SWAP TEXAS TI 994A, five cartridges, a pair of joysticks and cassette lead for a Dragon 32. Tel: Whitney 2494.

MAGAZINES FOR SALE, most back issues of Popular Computing Weekly, Personal Computer World, Y.C.P.C., ETCM, ZXC, M.C.P., S.U., C.T., P.C.T., since 1981, and some others. Tel: 0259 60840 after 6 pm.

TORCH 280 DISC PACK for BBC B micro, 1 month old, hardly used, only £620. Tel: 0344 886178 (anytime).

ASTROL TELESCOPE 60/60 and extending wooden tripod, swap for Spectrum 16K or above. Tel: 01-701 3091.

BACK ISSUES of computer magazines for sale including PCN, Personal Computer World, Your Computer, Sinclair Programs, Sinclair User, Practical Computing, PCT and others, offers, ring for details, 01-949 0225.

LYNX, 2 weeks old, as new, £200, or swap for Dragon 32. Tel: Richmond, North Yorks, 832210, 4.30 pm to 6 pm.

JUPITER ACE, £60 + adaptor + all leads. Tel: Toddington 2470.

ZENTRONIX 730 PRINTER, 80 or 132 column, 100 CPS, £100 ono. Tel: Ipswich 50836.

SEIKOSHA GP100A PRINTER, adapted for Vic 20 computer, + paper, £200, two months old. Tel: Cardiff 569752.

SEIKOSHA GP100A, 4 months old, £115 ono. BBC cable, £7.50. Hemel Hempstead 48141 (6 pm).

TEXAS TI 994A, unwanted xmas present, dual recorder leads, 4 cassette games, Munch Man modual, Speech Editor module, £130. Tel: 0302-723571 (daytime only).

SPECTRUM "FLOW-CHART" help plan programs, follow programs better than list. This program gives you an accurate flow-chart of basic Spectrum programs, £1.70. 4 Willesden Road, Cefn-Glas, Bridgend, S. Wales.

DIABLO 2.5 meg hard disc and power supply, Peritech 7-track tape deck, Texas silent-type printer. No reasonable offer refused. Tel: 0422 843348 evenings only.

BBC SOFTWARE, Alien Dropout, Centipede by Superior software, £3. Tel: 0482 849517.

HP 41CV swap for 48K Spectrum or sell for £150 plus games pack and manuals inclusive, mint condition. Tel: 01-272 7205 (ask for Mick).

SPECTRUM SOFTWARE, many well-known games to swap, will also buy your unwanted software. Tel: Basingstoke 56426.

INTELLIVISION CARTRIDGES, includes Lock n' Chase, Star Strike, Sea Battle, Golf, etc, £11 each. Tel: 0608-737224.

SWAP my Sharps Carousel Microwave oven with cookery books for Dragon 32 or Spectrum. Mrs. P. A. Hudson, Craignethan House Cottage, Mus-ton, Filey YO14 0EQ.

VIC20, Jelly Monsters, £13. Tel: Stafford 663166.

Wanted

ZX COMPUTER, with software up to £50. Tel: 01-688 0673.

DISC DRIVE for the Vic20 around £150, also Trackball suitable Atari, Vic20 around £30. Tel: 01-840 3610.

COMPILER REQUIRED for Spectrum, must be original with manual, will offer some of my original tapes or my Hemp-stone joystick if other software accompanies compiler. Tel: Rayleigh (0268) 779045, ask for Ray.

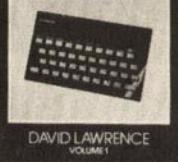
WANTED in good condition, Dragon 32, Spectrum 48K, Vic64 or BBC model B. Tel: Hemel Hempstead 68586.

WANTED, Commodore 8K Ram pack. Tel: 0442 58200.

Better books from Sunshine

THE WORKING SPECTRUM

A LIBRARY OF PRACTICAL SUBROUTINES AND PROGRAMS



DAVID LAWRENCE
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A collection of sophisticated Basic programs and subroutines including Unfile, Renumber (handles Gotos and Gosubs) education, accounts, games and scores of essential routines. Put your Spectrum to work with what must be the most comprehensive Spectrum book. 248pp £5.95*

Some of the more advanced programs in this collection include a word processor and text editor, a music and sound synthesiser, a sprite editor and a program which allows you to enter high resolution graphics mode. This is not available in the standard Basic. 160pp £5.95*

The Working Commodore 64



David Lawrence

The Working Dragon 32



*Available through W.H. Smiths and computer dealers

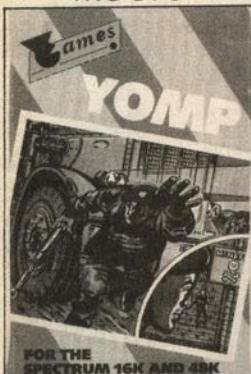
This computer has capabilities far beyond most other computers in this price bracket. With this collection of Basic programs and routines David Lawrence introduces word processing, music and shows you how to mix text and high resolution graphics. As with the other books in this series, each program is built up of re-useable subroutines. 160pp £5.95*



Trade/dealer enquiries welcome

NEW RELEASES

TROOPS



FOR THE SPECTRUM 16K AND 48K

Virgin Games has issued its first batch of games for the Spectrum, Vic and BBC micros.

The pricing of the games is interesting, in that they cost £7.95 each. Whilst this is fairly cheap for the BBC, it is decidedly expensive for the Spectrum — Virgin must be confident.

The first Spectrum releases contain some surprisingly conventional games. *Golf* and *Sheepwalk* for example. *Yomp*, you may remember, was the name given to the mode of travel adopted by the British troops across the Falklands — it is also the title of another of the Virgin releases.

You must command the Paras and guide your platoon across a busy enemy highway containing two lanes of traffic, which will run you over if... hang on I've heard this before somewhere...

If you succeed in getting three troops across the motorway, you can activate your radar scanner and direct your men across a minefield. Naturally, this involves not bumping into things or alerting the sentry — if you make it, your platoon gets three extra men.

Program Yomp
Price £7.95
Micro Spectrum 16/48K
Supplier Virgin Games
61-63 Portobello Road London W11 3DD

NOVICE

Cesil is a computer language that was specially developed to teach computer programming to novices — the letters stand for Computer Education in Schools Instruction Language. The language is now available

for the Spectrum on a cassette from Gilsoft.

Cesil divides programming commands into three types: Label, Instruction and Operand. Label is the actual command word like *Loop*. Instruction is the specific task, like *Print*, and the Operand is the actual data like *"Hello"*.

This format is capable of handling more or less all that Basic can and is supposed to be a better grounding for other computer languages.

The cassette comes with a 15 page instruction manual. A ZX81 version is also available.

Program ZX-Cesil
Price £5.95
Micro Spectrum
Supplier Gilsoft
30 Haworth Road Barry St Glamorgan CF6 8LE

MINEDI



Imagine has at last issued *Frantic* for the Vic20.

The aim of the game is to excavate and mine Spectrum's moons and, while you're at it, kill off various aliens whose home you are presumably exploiting.

You have a two-way radar, indicating the position of the aliens relative to you, and a laser with which to dispatch them.

Frantic was coded and designed by Eugene Evans who was featured in a number of articles in the national press and so is the closest to a programmer "celebrity" the industry yet has.

Program Frantic
Price £5.50
Micro Vic20
Supplier Imagine Software
Masons Buildings Exchange Street East Liverpool Merseyside L2 3PN

MARTIAN



Programmer, Gregory Trezise.

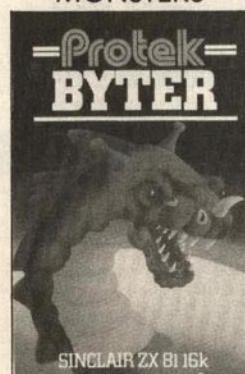
Given the quality of the machine (and forgetting the price), it is surprising there are not more arcade style games for the BBC B. Virgin has released three games for this machine as part of its move into the software market.

Landfall requires you to pilot your spacecraft to a safe landing on Mars. This is made difficult because you are running out of fuel. Success involves juggling with your velocity to keep it low.

The screen displays an instrument panel and a view from the cockpit window.

Program Landfall
Price £7.95
Micro BBC B
Supplier Virgin Games
61-63 Portobello Road London W11 3DD

MONSTERS



Protek is an Edinburgh-based company that has moved into the ZX market. At the recent microfair, it unveiled its first few releases.

Byter is a version of *Puckman* for the ZX81. The machine code program has all

the appropriate trappings like power pills and monsters but, unlike some other versions, you are given a choice of skill levels.

Program Byter
Price £4.95
Micro ZX81 16K
Supplier Protek Computing
Clydesdale Bank Building High Street South Queensferry Edinburgh EH30 9HW

COMMANDER

KayJay Electronic Services is a company that has previously specialised in hardware. It has now moved into the home computer market with *DIS-MON* — a machine code monitor for the Dragon.

The monitor gives all the usual functions through single letter entry. There are 20 commands, including a full disassembler and a load and save option.

Program DISMON
Price £18.86
Micro Dragon 32
Supplier KayJay Electronic Services
13 The Boulters Gorleston Great Yarmouth NR31 6TF

ACCOUNTED

The spreadsheet is a common accounting tool that has been made available for a number of micros. This now includes the 16K ZX81, following a new release from Myrmidon Software.

Draft comprises a program and 12 page instruction booklet. The program sets up a tabular worksheet into which is entered figures, formulae and text.

A report generator allows you to display any three columns on the screen and list all the information the sheet is carrying — unlike the usual technique, which is to create a "text window" which you move over the sheet using cursor keys.

Program Draft
Price £7.50
Micro ZX81
Supplier Myrmidon Software
PO Box 2 Tadworth Surrey KT20 7LU

NEW RELEASES

T-TEST

Rainbow Research has a number of packages available for home micros, particularly for the BBC B.

Statistics is a scientific and educational package which includes all the most common statistical procedures including T-test, chi-squared test, standard deviation, etc.

Program Statistics

Price £6.00
Micro BBC B
Supplier Rainbow Research
288 High Street
Ponders End, Enfield
Middlesex EN3 4HF

X 3

Tape 9 from Remsoft contains three games featuring the sound capabilities of the Jupiter Ace.

Bomber is a version of the classic *Blitz* game in which you have to demolish buildings before you can land. *Bouncy* is a version of *Breakout*, while *Gorger* is claimed to be a truly original program.

Program Tape 9

Price £5.50

Micro Ace

Supplier Remsoft

18 George Street

Brighton BN2 1RH

ODYSSEY

Astrodynamic seems to have been inspired by the film *2001*. Its *2002* is a program for the 32K BBC machine, based on the space station docking sequence from Kubrick's famous film.

You guide your spaceship into dock with a 3D high-res representation of the double wheel space station, using the six directional keyboard controls.

The instruction manual that comes with this program is sufficiently complex to make me think that this will not be a good game for those lacking in patience.

Program 2002

Price £6.95
Micro BBC 32K
Supplier Astrodynamic
30 Canberra Road
Leyland, Lancs

RESCUED!

Solar Soft is a new company in the BBC market. Its first release is *Zany Kong*, a version of the arcade game *Donkey Kong*.

The game requires 32K and will work on all the operating systems.



For the few people who have never heard of the game, it features a little man you must guide up a series of ladders. At the top of the ladders stands a giant monkey which is hurling things at you — your mission is to reach the top and rescue a girl from a fate worse than death.

Program Zany Kong

Price £6.50
Micro BBC (32K)
Supplier Solar Soft
5 Westmorland Drive
Cambridge
Surrey GU15 1EW

CHINESE

Viscount Software's first release is *Character Generator* for the BBC.

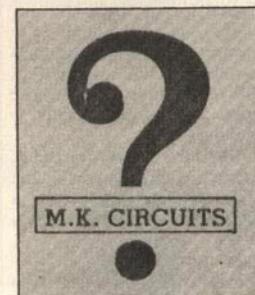
The character set can be defined on an 8 by 8 grid. This means that, for example, you could make your BBC print in Arabic or Chinese.

The program features a number of other options like inversion and rotation of characters, as well as saving characters to tape for use in your own programs.

Program Character Generator

Price £9.95
Micro BBC A or B
Supplier Viscount Services
Computer World
24 Boulton Road
Southsea
Hants

HIGH IQ



Micro IQ is an educational program for the Spectrum. It manages to squeeze 250 questions and 1,000 possible answers into the machine, by dividing the test into nine separate parts which are loaded in sequence.

Although called *IQ*, the questions are about the history of computers and the Spectrum.

Your percentage score is given as you go along — the correct answer being one of four from which you must choose in a multiple choice format.

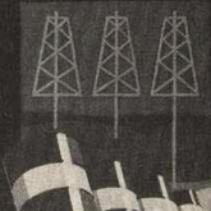
Program Micro IQ

Price £5.00
Micro Spectrum 16/48K
Supplier MK Circuits
63 Felstead Road
Grimsby
South Humberside

JR!

ORIC 1.48K

DALLAS



STRATEGY GAMES

Cases Computer Simulations has a number of "tactics and strategy" type games available on the Oric and Spectrum.

Dallas for the 48K Oric is a business simulation taking oil as its theme. Like ruthless entrepreneur J. R. Ewing, you must develop and exploit a number of oil fields until you have accumulated 280 million dollars in cash and assets.

The program gives you a menu of options like drilling and seismic survey. Various disasters can be expected like blow-outs, tornados and, worst of all, government tax increases.

A Spectrum version is also available.

Program Dallas

Price £7.95
Micro Oric 48K
Supplier Cases Computer Simulations
14 Langton Way
Blackheath
London SE3 7TL

New Releases is designed to let people know what software is coming on to the market. If you have a new game or utility which you are about to release send a copy and accompanying details to: New Releases, Popular Computing Weekly, 19 Whitcomb Street, London WC2 7HF.



A question of Interpretation

Last week I described a program to turn a decimal value into its binary equivalent:

```

10 DIM WORD$(15)
20 INPUT "Value": X
30 FOR I = 0 TO 15
40 WORD$(I) = CHR$(48 + FNBIN(X))
50 X = FNBODY(X): NEXT I
60 FOR I = 15 TO 0 STEP -1
70 PRINT WORD$(I)
80 NEXT I: PRINT
90 PRINT "BODY IS": X
1000 DEF FNBIN(X) = X - INT(X/2)*2
2000 DEF FN BODY(X) = INT(X/2)

```

The binary value is stored in successive elements of the character array *Words*.

If the value 65535 is entered, then the binary equivalent is found to be 1111 1111 1111 1111, and the body is 0. When the value -1 is then tried, the equivalent is also 1111 1111 1111 1111, but the body is -1 for this negative number. It is found for any negative number that the body is always negative.

What is -3/2 in integer arithmetic? We can find out quite simply by *Print Int(-3/2)* which reveals that the answer is -2. Why?

Enter the value -3 in the program, and you get the answer 1111 1111 1111 1101. Moving it all one place to the right produces 0111 1111 1111 1110 (the binary equivalent of 32766). This is not correct; but perhaps as the body is -1 (ie X when all is finished), the result of moving to the right should be 1111 1111 1111 1110 (the binary equivalent of -2)?

That computers tend to use binary arithmetic (and the strange form we have discovered) is why we find that *Int(1/2) = 0*, but *Int(-1/2) = -1* (check the binary equivalents).

The *Int* operation (on most computers) rounds down, because the last bits are lost. The binary value 1111 1111 1111 1111 is what is termed the *two's complement* of the decimal value -1,

and helps explain why on many computers the size of integer numbers varies from 32767 to -32768.

Using the program with the decimal value 32767 produces 0111 1111 1111 1111, whereas -32768 produces 1000 0000 0000 0000 (which, incidentally, is also the value produced by 32768).

Comparing the two values gives the clue. If there is a zero in the left-most bit, then the number is treated as if it were positive; if there is a one in the left-most bit, then the number is treated as if it were negative.

If we perform the addition 32767 plus 1 in integer arithmetic (assuming two bytes), we either find that the result is -32768 (in Fort and in a very few Basics) or we find that there is an overflow error. There is an overflow because we have added two positive numbers to produce a negative number. Depending on how good the Basic interpreter is, such errors are always picked up — some interpreters can be fooled with strange arrangements, and it is possible for the interpreter to accept the sequence:

20000 - 10000 + 20000

but not:

20000 + 20000 - 10000

because, in the second case, 20000 + 20000 is 40000 and produces an overflow.

The Acorn Atom has no error checks for the size of numbers and is an ideal machine on which to investigate computer arithmetic. You do not have to construct the equivalent of a two-byte integer (note that the BBC and Atom have four-byte integers) to investigate the vagaries (or what seem to be vagaries) of computer arithmetic. It is very simple to illustrate computer arithmetic by the use of commands to store and fetch numbers from bytes (*Poke* and *Peek*).

On most microcomputers (ie, not the BBC or Atom) to put the value X in the location L, we write *Poke L,X* — different computers have differing restrictions on the values that X can take.

For a few computers no restrictions are placed on the value taken by X: one byte has eight bits, so it can take values from 0 to 255. Thus for these computers X is then turned into a value from 0 to 255. If X is 500 then the value 500 - 256 = 254 is stored in the byte.

Many others will allow values from -255 to 255 — try +1 (ie, *Poke L,-1*) to be followed by *Print Peek(L)*. The value fetched by the *Peek* is 255, which as eight bits is 1111 1111.

Boris Allan

Puzzle

The case of the missing digits

Puzzle No 62

Professor Otto Hex was posing mind-boggling questions to his students again: "It's just a matter of even numbers," he remarked, plastering equations all over the blackboard.

$$\begin{aligned} \sqrt{E} &= E \\ \sqrt{EE} &= E \\ \sqrt{EEE} &= EE \\ \sqrt{EEEE} &= EEE \\ \sqrt{EEEEEE} &= EEE \\ \sqrt{EEEEEEE} &= EEE \\ \sqrt{EEEEEEE} &= EEEE \end{aligned}$$

"In each of the above expressions the letter E indicates any even digit — 2, 4, 6 or 8. E never equals zero, although there is one zero shown in the last but one equation.

"Can you fill in the missing digits?" he demanded. "Not a chance," they responded. Can you?

Solution to Puzzle No 57

First we need to find all possible right-angle triangles with integral sides, having a perimeter of 360 yards. (The hypotenuse of such a triangle must lie between 360/2 and 360/3 yards.)

Using the following program:

```

10 FOR H = 360/3 TO 360/2. 20 FOR S = 1 TO H - 1.
30 LET T = SQR(H * H - S * S). 40 LET T = VAL
STRS T. 50 IF H + S + T = 360 THEN PRINT T;:
";";":H. 60 NEXT S. 70 NEXT H.

```

The program reveals four such triangles with sets of sides: (36,160,164); (60,144,156); (72,135,153); and (90,120,150). The relevant areas of each can be found by finding half the product of the first two figures in each set.

As we know that all the statements were false then Farmer Giles cannot live at Mayfield, nor Farmer Stiles at Hilltop. Farmer Miles does not live at Cowslip or at Hilltop (the farmyard with the longest side).

The only farm with any non-even sides is Dewdrop, so this is where Farmer Wiles must live. Thus, Farmer Miles must live at Mayfield, Farmer Stiles at Cowslip and Farmer Giles at Hilltop.

Winner of Puzzle No 57

The winner is: Cliff Hicks, Burdale Close, Norton, Malton, N Yorks, who receives £10.

Top 10

Top 10

Top 10

Top 10

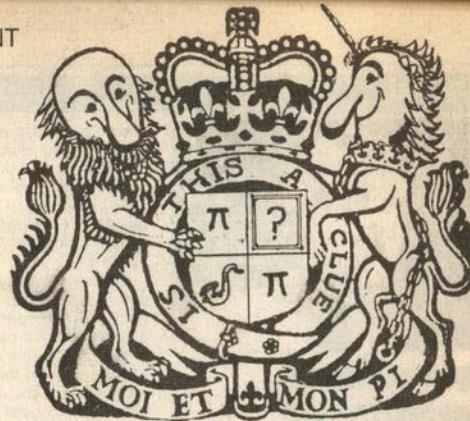
Dragon		Spectrum		Atari		Vic20	
1 (2) Killer Gorilla	(Program Power)	1 (1) Flight Simulation	(Psion)*	1 (4) Escape from Perilous	(English Software)	1 (1) Panic	(Bug-Byte)
2 (3) Great Britain Limited	(Simon W Hessel)	2 (3) Penetrator	(Melbourne House)*	2 (5) (Datasoft)	2 (3) Galaxia	2 (3) Galaxia	(Imagine)
3 (2) Space War	(Microdeal)	3 (4) Transylvanian Tower	(Richard Shepherd)*	3 (1) Stone of Sisyphus	(Adventure International)\$	3 (4) Cosmoids	(Bug-Byte)
4 (5) Dragon Trek	(Salamander)	4 (2) Jet Pac	(Ultimate)	4 (4) Xenon Raid	(English Software)	4 (2) Wacky Watters	(Imagine)
5 (—) Defence	(Microdeal)	5 (5) The Hobbit	(Melbourne House)	5 (3) Time Warp	(English Software)	5 (8) Catcha Snatcha	(Imagine)
6 (4) Katerpillar Attack	(Microdeal)	6 (6) 3D Tanks	(DK Tronic's)	6 (6) Preppie 2	(Adventure International)	6 (7) Amok	(Audio/Logic)
7 (9) Chess	(Dragon Data)*	7 (8) Horace Goes Skiing	(Fision/Melbourne House)	7 (—) Air Strike	(English Software)	7 (6) Asteroids	(Bug-Byte)
8 (7) Grand Prix	(Salamander)	8 (7) Ah Diddums	(Imagine)	8 (—) Napoleon's Curse	(Synapse)†	8 (—) Blitz	(Commodore)
10 (—) Computer Voice	(Dragon Data)	9 (—) Orbiter	(Silversoft)	9 (8) Castle Wolfenstein	(Muse)‡	9 (—) Introduction to Basic Part 1	(Commodore)
10 (—) Dragon Quest	(Dragon Data)	10 (9) Arcadia	(Imagine)	10 (—) Defense	(Atari)	10 (—) Choplifter	(Audio/Logic)
"Cartridge" (Figures compiled by Boots & Co, London)		Requires 48K.		132K cassette, £32K disc, £48K disc.		(Figures compiled by Calisto Computers, Birmingham 021-632 6458)	
*Requires 48K. †Requires 48K. ‡Requires 48K.							
BBC		ZX81*		Books		Books	
1 (2) Killer Gorilla	(Program Power)	1 (1) 3D Monster Maze	(New Generation)	1 (1) Vic Programmer's Reference Guide, Commodore	(Commodore)	1 (1) Vic Programmer's Reference Guide, Commodore	(Macmillan)
2 (3) Great Britain Limited	(Simon W Hessel)	2 (2) Flight Simulation	(Psion)*	2 (4) Assembly Language Programming for the BBC Micro, Birnbaum	(Melbourne House)	2 (4) Assembly Language Programming for the BBC Micro, Birnbaum	(Melbourne House)
3 (1) Word Wise	(Computer Concepts)	3 (4) OS Scramble	(Quicksilver)	3 (8) Enter the Dragon, Carter	(Newnes)	3 (8) Enter the Dragon, Carter	(Newnes)
4 (4) Rocket Raid	(Acornsoft)	4 (5) Space Dropout	(Silversoft)	4 (2) Speedy Eddie and the Musical Dickens, Williams	(Newnes)	4 (2) Speedy Eddie and the Musical Dickens, Williams	(Newnes)
5 (—) View	(Acornsoft)	5 (5) Gaixians	(Artic)	5 (6) Programming the BBC Micro, Williams	(Newnes)	5 (6) Programming the BBC Micro, Williams	(Newnes)
6 (—) Landfall	(Virgin Games)	6 (3) Chess	(Psion)	6 (6) Spectrum ROM Disassembly, Logan	(Newnes)	6 (6) Spectrum ROM Disassembly, Logan	(Newnes)
7 (—) Fireball	(Acornsoft)	7 (9) 10 Games for 1K	(J K Greyley)†	7 (9) 6502 Machine-code For Beginners, Stephenson	(Osborne)	7 (9) 6502 Machine-code For Beginners, Stephenson	(Osborne)
8 (9) Home Finance	(BBC1)	8 (—) Asteroids	(Asteroids)	8 (5) 6800 Assembly Language Programming, Leventhal	(Interface)	8 (5) 6800 Assembly Language Programming, Leventhal	(Interface)
9 (—) Moon Raider	(Program Power)	9 (8) Avenger	(Abacus)	9 (10) Dynamic Games for Your Dragon, Hartnell	(Commodore)	9 (10) Dynamic Games for Your Dragon, Hartnell	(Commodore)
10 (6) Inheritance	(Simon W Hessel)	10 (—) Night Gunner	(Digital Integration)	10 (3) Commodore 64 Programmer's Reference Guide, Commodore	(Commodore)	10 (3) Commodore 64 Programmer's Reference Guide, Commodore	(Commodore)
*Model B only except where shown. †Runs on 16K.		All 16K except where shown. ‡Runs in 1K.		(Figures compiled by Watford Technical Books, Watford 0923 23324)		(Figures compiled by Watford Technical Books, Watford 0923 23324)	
(Figures compiled by Micro Management, Ipswich 0473 59181)							

PiMan awarded a Knighthood

The home-micro-world is still in a state of hangover, following the celebrations marking the Knighthood recently bestowed on the PiMan. In the latest Honours List "Sir" PiMan was commended for 'spreading joy and happiness across the planet,' with his cult adventure quest PIMANIA!! But our ace reporter, Ivor Duff-Sinclair, has discovered a sinister political motive behind the PiMan's elevation to the House of Lords.

The Hideous Truth

During the recent election campaign the entire Labour Party spent all of their time palying "PIMANIA, the best adventure game ever reviewed" and consequently lost their marbles. The SDP / Liberal Alliance unfortunately couldn't get any programs to load. But amazingly, the whole Conservative Party dedicated their campaign to palying the PiMan's new game "AUTOMONOPOLI", recognised as the best version available of this classic game, where you can play a dinamic challenge against your own computer! The PiMan's Knighthood is a blatant reward for these services. Several leaders of British political parties have now announced their resignations so that they can devote the rest of their lives to revelling in the wonderful software produced by... AUTOMATA, "WE PUT SOME TING IN COMPUTING".



Since the launch of PIMANIA nine months ago, there have been several imitations of this brilliantly original program. Some 'prize games' were launched, and never heard of again, some were won within 72 hours, and some others were a load of old [REDACTED] (see you in court, baby.)

Giving away £6,000 worth of gold and diamonds that have been exquisitely crafted by the winner of The De Beers-Diamond International Award is quite a serious business....hic....So we are taking the trouble to restate the rules now, that are clearly set out in every copy of PIMANIA:- here goes..... Any PIMANIAC who believes that they have solved the Quest, must be present at the right place, at the right time, on the right date. It is in the nature of the Quest that there can only be ONE WINNER. No correspondence please, the PiMan's decision will be final. And by the way, to the loonies going to Bethlehem on Christmas Day, and the person trying to book a flight on the Space Shuttle.....don't bother! Please!

NO ONE HAS WON THE
GOLDEN SUNDIAL OF PI
.....YET!!!



The Golden Sundial of Pi

DEAR AUTOMATA, DESPITE YOUR VERY SILLY ADVERTISING, I AM ORDERING THE FOLLOWING COMPUTER SOFTWARE FROM YOU.....	
AUTOMONOPOLI (Spectrum 48K) @£6.00p	<input type="checkbox"/> tick?
PIMANIA (Spectrum 48K) @£10.00p	<input type="checkbox"/>
PIMANIA (Dragon32) @£10.00p	<input type="checkbox"/>
PIMANIA (BBC Micro 32K) @£10.00p	<input type="checkbox"/>
PIMANIA (ZX81 16K) @£5.00p	<input type="checkbox"/>
I enclose the right money, TOTAL £ <input type="text"/>	<input type="checkbox"/>
or please charge my ACCESS/EUROCARD/MASTER CARD.	
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